LaPINE 1969

teaching aids for **MATHEMATICS**

Mathematics

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Exclusive Distributors of Gunter Herrmann Mathematical Models in the United States

- Superb Construction–Mathematically correct
- Finest quality plastics–Plexiglas®, Aastralon®, Plexigum®
- Iridescent colors for visual contrast

LaPINE

At LaPine Scientific Company we conscientiously strive to select for our customers mathematics teaching aids that are peerless in quality. We want to join you in our mutual responsibility—preparing young people for living in a world of mathematical questions.

Here is your 1968-69 LaPine Catalog of mathematics teaching equipment. We are sure you will find the book represents a complete line, equipment for all grades, Elementary and Junior High School through Senior High School and College. Although the book presents selections applicable to the basic studies of mathematics, it also contains a variety of the more sophisticated equipment required for advanced curricula.

NDEA (Title III) Approved Equipment

The Gunter Herrmann models and LaPine math teaching aids listed in this catalog are eligible for purchase under Title III regulations and various other Federal assistance programs, in most states.

Many of these items are specifically included in the "Purchase Guide." For your convenience, we have listed the "Purchase Guide" or PG number of applicable items.

Grade Level. To assist teachers, supervisors and administrators in the selection of models, items in the catalog have been marked to indicate the grade level for which they are most appropriate. This key appears at the bottom of each page.

L Lower Elementary	A Algebra
U Upper Elementary	G Geometry
J Junior High School	T Trigonometry

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Our guarantee: We guarantee that the apparatus and equipment furnished by us will meet the specifications stated in this catalog. If, for any reason, you find such material unsatisfactory, it will be replaced at once, or other satisfactory adjustments made.

Design improvements are constantly being made by our engineers as well as the leading suppliers whose merchandise we catalog, and model specifications may be different in some cases than those listed here.

Prices and Terms

All orders are conditional until acceptance at our offices in Chicago, Illinois; Norwood, New Jersey; or Berkeley, California.

All prices shown in this catalog were current at time of publication, F.O.B. Chicago. **They are subject to change without notice.** Firm current prices will be quoted promptly upon request.

Terms to customers in the United States and Canada are Net 30 days, after credit has been established. Invoices to Canadian customers are payable in United States exchange. Foreign orders, except from Canada, should be accompanied by a bank draft or irrevocable letter of credit, unless other credit arrangements have been made. We require cash with order from individuals, including sufficient funds to defray shipping charges. We will refund any excess.

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New for 1969—LaPine Scientific Company Introduces...

Projecta-Math™ Models

• Accurate • Versatile • Enlightening • Fit All Standard Overhead Projectors • Movable and Dissectible Plane Geometry Demonstrations • Transparent Plexiglas® Baseplates with Vivid, Contrasting Colored Removable Sections.

Your mathematics teaching gains additional creative possibilities when you project your actual demonstration so that each student has a front-row seat. Our widely accepted Plane Geometry models have been redesigned expressly for use with any overhead projector, so that you may develop the lesson - adding, removing, or adjusting sections of the model as you teach the applicable formula.

LaPine Projecta-Math Models far surpass static chalkboard demonstrations and diagrams, even ordinary transparencies which cannot be manipulated. Their clarity and versatility are enhanced by vivid contrasting colors. Transparent Plexiglas baseplates measure 9⅞" x 11⅝" x ⅛" thickness.

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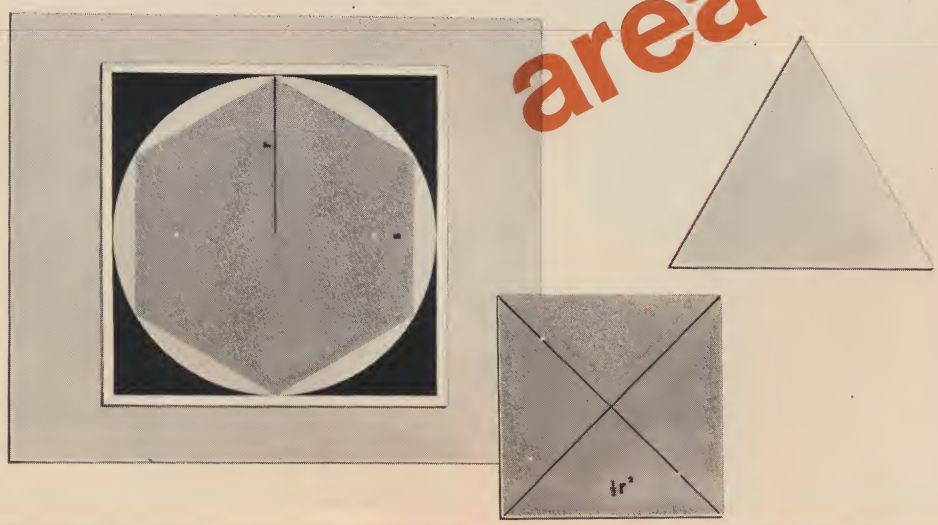


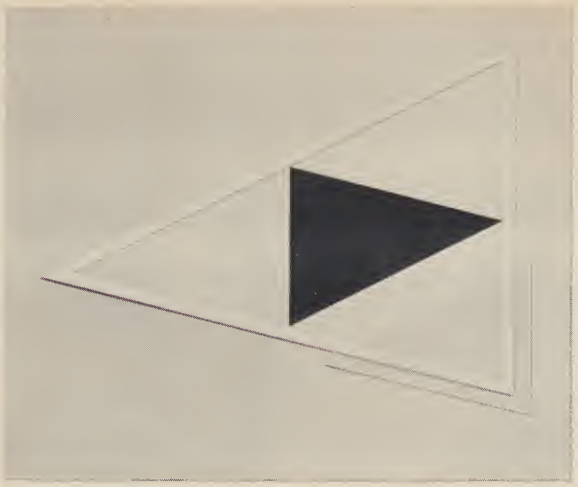
CIRCLE AND INSCRIBED FIGURES

This unique and versatile model creates student comprehension of the formulas for circumference ($C = \pi rd$) and area (πr^2) of the circle. A raised circle (7" diameter) is mounted on the transparent baseplate; any of three colored sections fit within the circle precisely (or may be projected separately for study of their individual characteristics).

The hexagon (colored red) measures 6⅛" on a side; 5" square (red) measures 7" from corner to corner. Equilateral triangle is colored green.

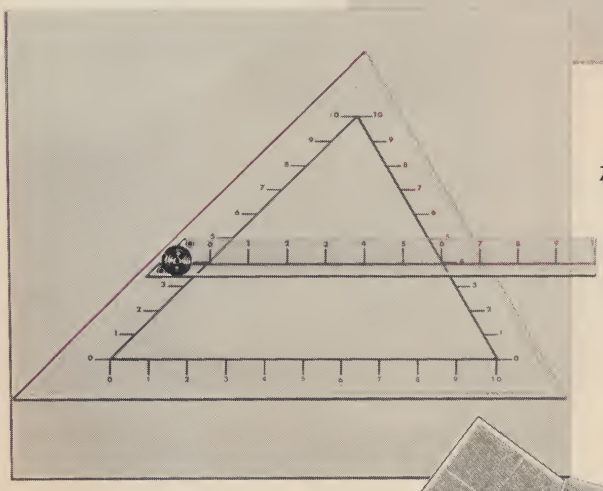
Z-9713 .....14.50

triangles



Z-9146T

Z-9149T



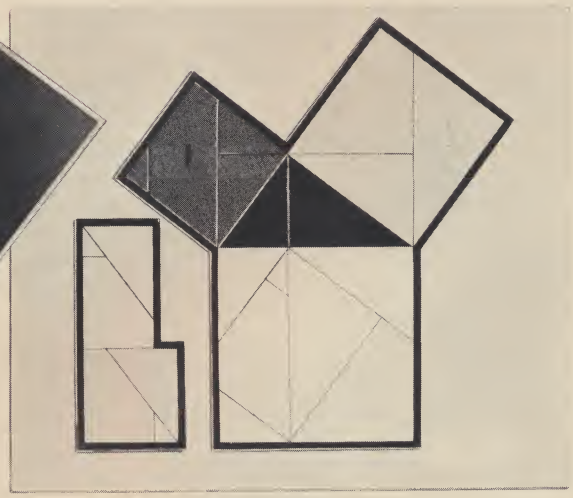
Z-9145T

TRIANGLE, MID POINT
Basic theorems of similarity, perimeter and area are illustrated by this attractive model. One basic triangle (9¾" high) contains two smaller triangles. The iridescent green triangle (with knob) is removable and fits precisely into any of three positions. The stationary center triangle is colored red.
Z-9146T **15.50**
Z-9146 Same as above, except with opaque base (not suitable for overhead projector use). **14.00**

RIGHT TRIANGLE, RATIO
Brilliantly colored clear plastic triangles are inserted to clarify the relationships between the legs, altitude and segments of the hypotenuse of a right triangle. Each basic triangle measures 6⅛ x 8 x 10¼ inches.
Z-9149T **16.50**
Z-9149 Same as above, except with opaque base (not suitable for overhead projector use). **14.50**

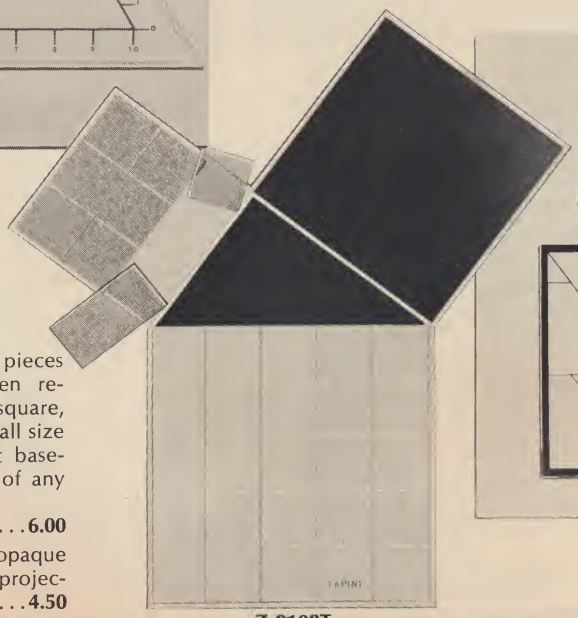
TRIANGLE, TRANSVERSAL
Triangle with bar which moves parallel to base line along 10 graduations to show theorems of proportion. Bar is colored yellow. All graduations are marked in red for easy reading. Base of triangle 11⅜ inches.
Z-9145T **16.40**
Z-9145 Same as above, except with opaque base (not suitable for overhead projector use). **14.50**

PYTHAGOREAN THEOREM SET
For study of the Pythagorean Theorem and theorems of Thales and Euclid. The model demonstrates: Each leg of a right triangle is the mean proportional between the hypotenuse and the adjustment segment of the hypotenuse; The altitude is the mean proportional between the segments of the hypotenuse. Two smaller squares have removable colored areas which can be repositioned to fill the largest square.
Z-9142T **27.00**
Z-9142 Same as above, except with opaque base (not suitable for overhead projector use). **25.00**



Z-9142T

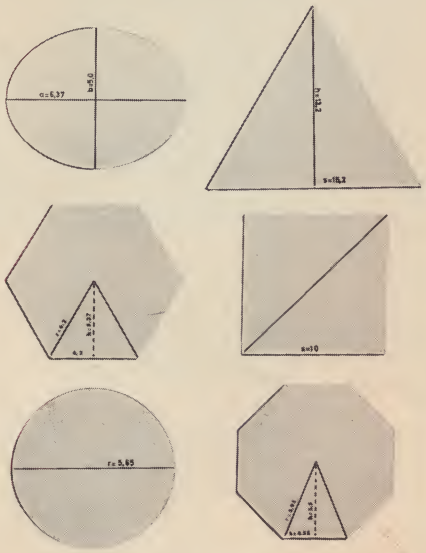
PYTHAGOREAN THEOREM
Project this model with colored pieces filling the 2 smaller squares, then rearrange the pieces to fill the large square, demonstrating $A^2 + B^2 = C^2$. Overall size approximately 8" x 8½"; without baseplate, this model will fit the bed of any overhead projector.
Z-9108T **6.00**
Z-9108 Same as above, except with opaque base (not suitable for overhead projection). **4.50**



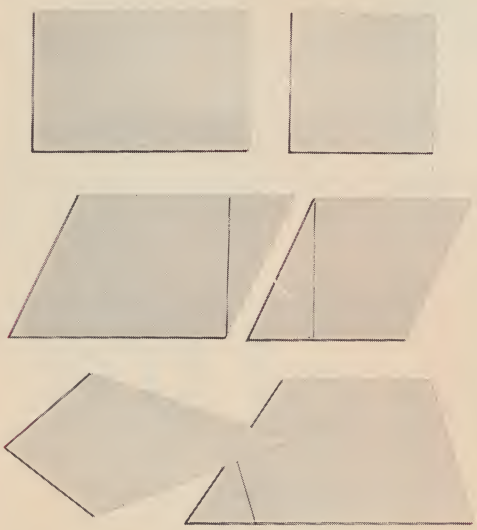
Z-9108T

LaPine Projecta-Math™ Models

Clarify difficult concepts by giving each student a front-row seat!
Accurate . . . Attractive . . . Versatile!

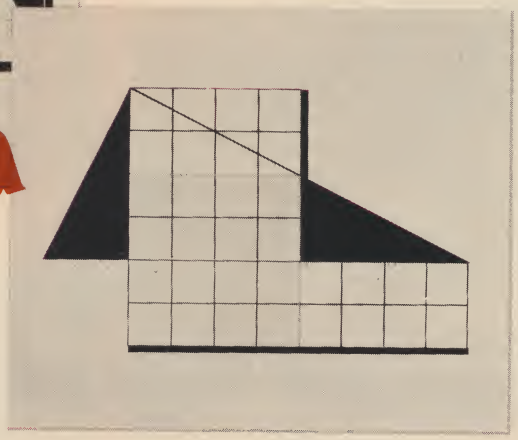


Z-9153



Z-9429

Z-9141T



algebra

Z-9144T

PROJECTABLE PLANE FIGURES SET 1
A set of six common plane figures: Square, Triangle, Ellipse, Octagon, Circle, and Hexagon. Shows length of one characteristic dimension on each 100 cm² area. Useful for introducing area and perimeter concepts. Transparent colored Plexiglas with black markings.
Z-9153 ..... **7.00**

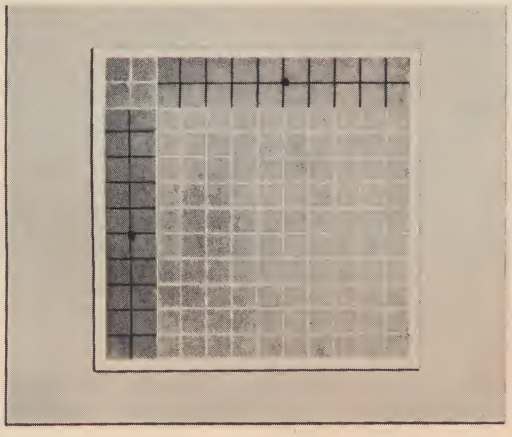
PROJECTABLE PLANE FIGURES SET II
Set includes six plane figures of transparent colored Plexiglas. Consists of Rhombus, Rectangle, Square, Trapezoid, Parallelogram, and Quadrilateral. An ideal supplement to the Z-9153 set. Red markings.
Z-9429 ..... **8.50**

TRAPEZOID
This colorful model assists student understanding of the trapezoid area formula. 9¼ x 4⅜ inches, with two removable yellow colored pieces for transformation of the rectangle. Stationary parts are bright red.
Z-9141T **20.00**
Z-9141 Same as above, except with opaque base (not suitable for overhead projector use). **18.00**

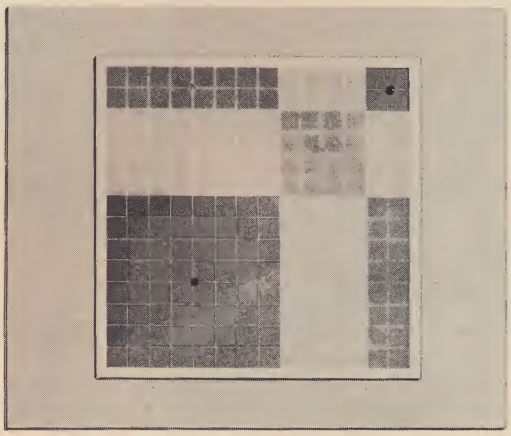
TRIANGLE, ALTITUDE THEOREM
Shows that the altitude is the geometric mean of the segments of the hypotenuse. Two movable (yellow) rectangular sections; all stationary sections of model colored red; black printed markings.
Z-9144T **17.50**

BINOMIAL SQUARE
A simple but effective demonstration of the formula: $(a + b)^2 = a^2 + 2ab + b^2$. Four colored Plexiglas sections are removable from the 7½″ square mounted on the baseplate.
Z-9139T **22.00**
Z-9139 Same as above, except with opaque base (not suitable for overhead projector use). **20.50**

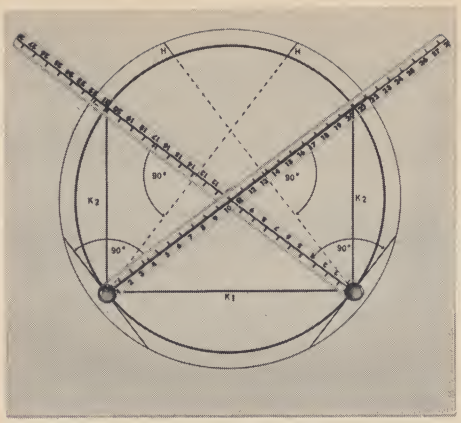
TRINOMIAL SQUARE
Clearly demonstrates the formula: $(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2ac$. Nine removable colored Plexiglas sections fit the 7½″ square mounted on the baseplate.
Z-9088T **22.00**
Z-9088 Same as above, except with opaque base (not suitable for overhead projector use). **20.50**



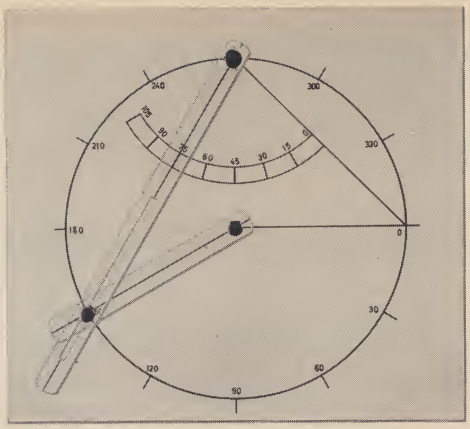
Z-9139T



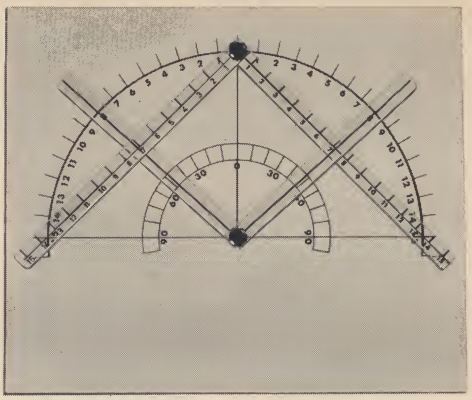
Z-9088T



Z-9162T

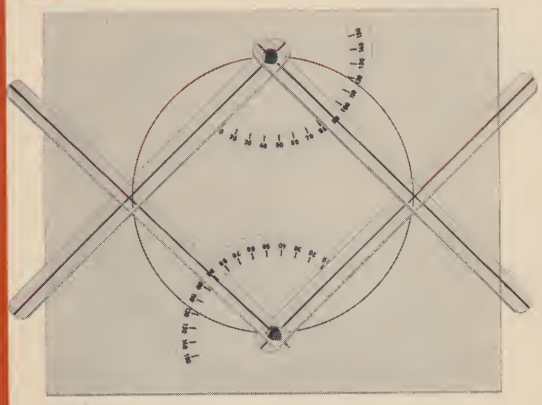


Z-9163T

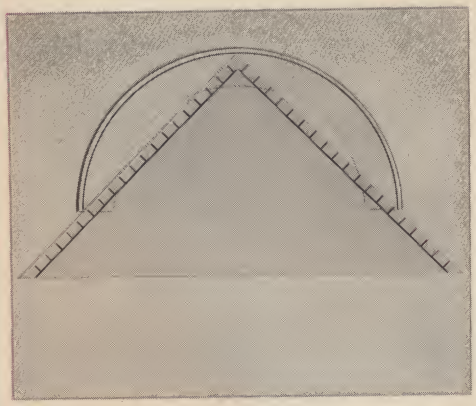


Z-9157T

geometry of the circle



Z-9161T



Z-9159T

INSCRIBED ANGLE
Compare central and inscribed angles subtending the same arc. Locate vertex of inscribed angles at various points to demonstrate equality of such angles. Removable yellow Plexiglas triangle. Diameter 8 inches.
Z-9158T **17.50**

Z-9158 Same as above, except with opaque base (not suitable for overhead projection). **16.00**

CIRCLE-CHORD RATIO
The movable yellow bars attached to the baseplate may be used either as chords or as tangents. They are clearly marked in black to help establish proportion properties. Diameter of circle imprinted on baseplate 8⅞ inches.
Z-9162T **16.50**

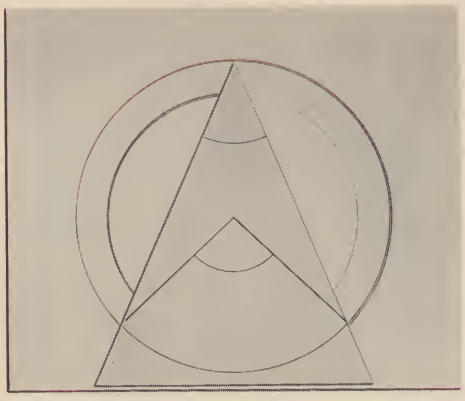
MEASUREMENT OF INSCRIBED AND CENTRAL ANGLES
This device features two movable colored bars which show clearly that inscribed angles are only half as large as central angles subtending the same arc. Circle and all markings imprinted in black on baseplate. Diameter 8⅝".
Z-9163T **16.40**

MEASUREMENT OF CENTRAL ANGLES
Utilizing four movable colored bars, this model shows the relation of an angle to an intercepted arc; it also shows that the radius which bisects an arc bisects its chord, and that equal chords of equal circles intercept equal arcs. 200° arc; 9 inch dia.
Z-9157T **21.50**

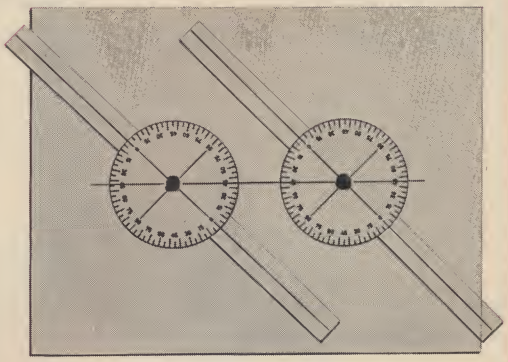
QUADRILATERAL INSCRIBED IN CIRCLE
Movable bars demonstrate that opposite angles of an inscribed quadrilateral are supplementary. Many such quadrilaterals may be studied; also the equality of angles inscribed in the same arc. Diameter 7 inches.
Z-9161T **16.50**

SEMI-CIRCLE, INSCRIBED ANGLE
Semi-circle is locus of points traced by vertex of right angle whose sides pass through end points of diameter of semi-circle. Removable triangle may be variously placed, but vertex always falls on semi-circle. Diameter 11 inches.
Z-9159T **10.00**

Z-9159 Same as above, except with opaque base (not suitable for overhead projection). **9.00**



Z-9158T

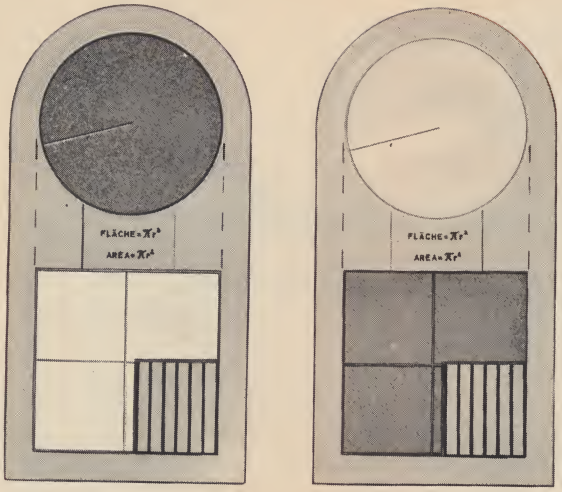


Z-9100T

PARALLELS AND TRANSVERSAL
Inaccurate sketches confuse the student, but a model such as this makes clear the pairs of equal and supplementary angles formed by parallels and a transversal. Bars are 12 inches long.
Z-9100T **18.50**

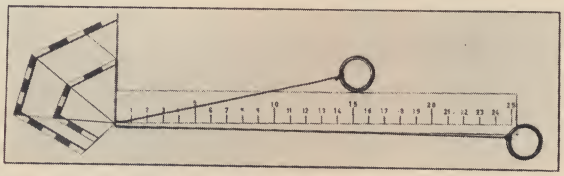
Z-9100 Same as above, except with opaque base (not suitable for overhead projection). **17.50**

Plane Geometry



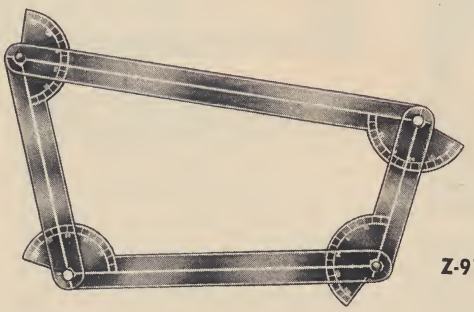
CIRCLE AREA — Tip the model so all the sand runs into the circle. Then reverse it and the sand will fill 3-1/7 squares, each the radius of the circle on a side. This shows that area is Pi times the square of the radius. 10 inches high.

Z-9167 (Two views) ..... **(U—J—A—G)** **14.25**



SIMILAR POLYGONS, PERIMETER — Cords may be wrapped around each pentagon then measured on scale to illustrate the theorem: Perimeters of similar plane figures are in the same ratio as corresponding sides.

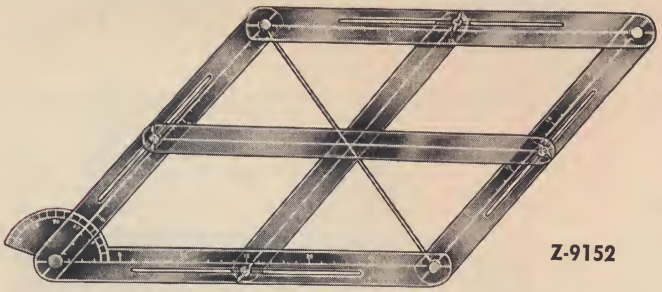
Z-9154 ..... **(J—A—G)** **23.50**



Z-9102

QUADRILATERAL — Sides of this figure may be adjusted in countless ways but the sum of the interior angles is always the same. Longest side over 14 inches.

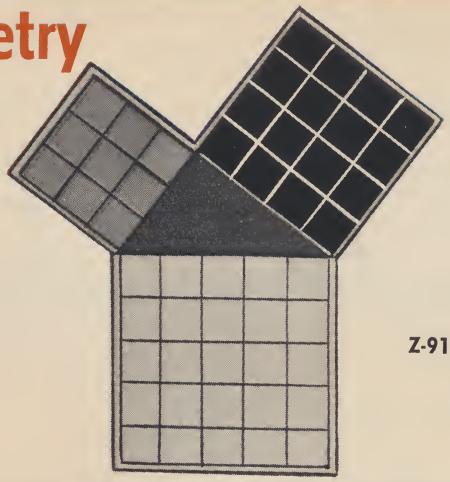
Z-9102 ..... **22.00**



Z-9152

PARALLELOGRAM — Center bars and sides may be moved to show an infinite number of quadrilaterals, parallels and transversals. 11 inches x 14 inches.

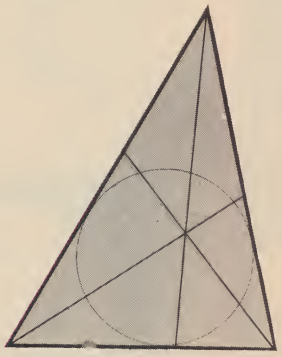
Z-9152 ..... **(G)** **19.00**



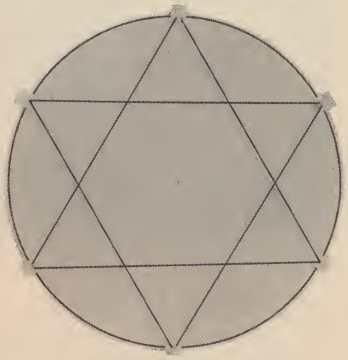
Z-9108

PYTHAGOREAN THEOREM 3-4-5 DEMONSTRATION SET — Plastic pieces may be arranged to fit the large square on the two smaller ones. Demonstrate that the sum of the square areas constructed on the legs of the right triangle equals the square area on the hypotenuse. The large square (4 inch sides) has raised edges and is marked with smaller squares. Plastic pieces are removable in the other squares and fit into the hypotenuse square. Differentiating colors are used to clarify this concept. **A new version of this popular model—featuring a transparent base which makes it suitable for use with your overhead projector, is listed in this catalog with other projectable models.**

Z-9108 ..... **(U—J—A—G)** **4.50**



Z-9734



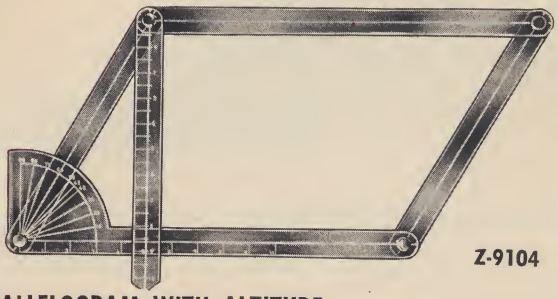
Z-9735

TRIANGLE DEMONSTRATOR — 20" long plastic triangle with elastic cords attached to vertices and opposite sides. Cords may be adjusted to demonstrate theorems on medians, altitudes, and angle bisectors. Markable surface; permanent in circle.

Z-9734 ..... **19.50**

CIRCLE DEMONSTRATOR — Elastic strings attach to 6 movable points on circumference, showing chords, diameters, inscribed angles and polygons. Markable surface is 12" diameter.

Z-9735 ..... **19.50**



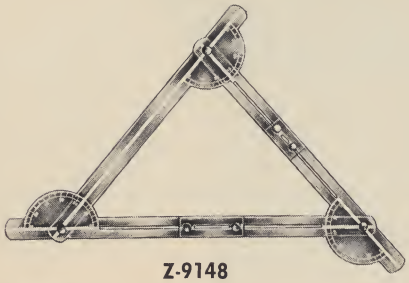
Z-9104

PARALLELOGRAM WITH ALTITUDE — Altitude is fixed at right angles to upper base allowing parallelograms of various shapes. Protractor on lower base. Model may be used to show trigonometric ratios also. Sides are 9 inches and 12 inches.

Z-9104 ..... **(J—A—G)** **22.50**

L-Lower elementary. U-Upper elementary. J-Junior high school. A-Algebra. G-Geometry. T-Trigonometry.

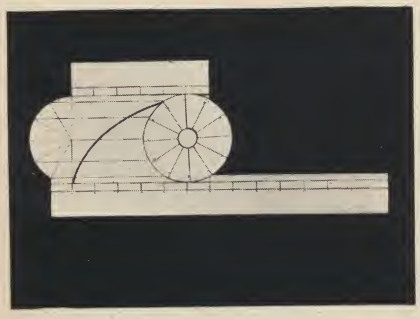
Plane Geometry



Z-9148

TRIANGLE — Two sides of this plastic triangle are adjustable. There is a permanent protractor at each vertex for angle measurement. Triangle's sides may be adjusted to a variety of positions to verify that the angle sum is always 180°, perfect for overhead projection. Sides are 10, 11, and 15 inches (expanded).

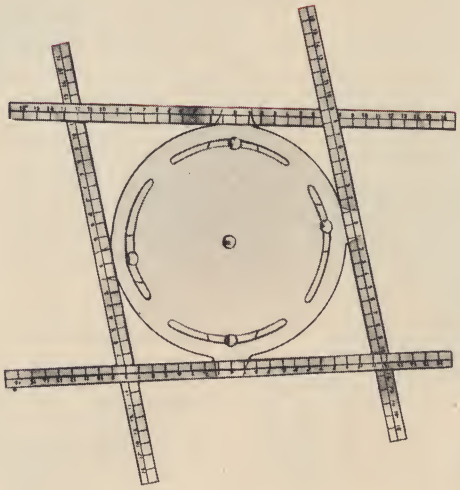
Z-9106 ..... **22.50**



Z-9220

HYPOCYCLOID and CYCLOID — These models make it possible to demonstrate several advanced locus theorems almost impossible to do without them. Each may be attached to the blackboard with the suction cups furnished so that the entire class may see at one time. Well made of high quality white plastic.

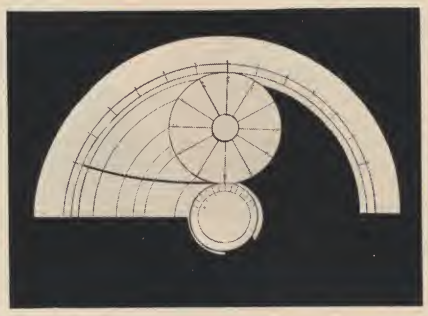
Z-9037 ..... Hypocycloid 19" diam. **32.50**
Z-9220 ..... Cycloid 24" long **37.50**



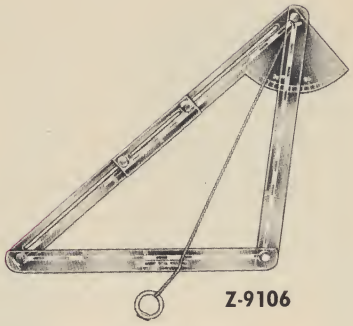
Z-9160

QUADRILATERAL CIRCUMSCRIBED ABOUT A CIRCLE — Each tangent may be located at any point along a quadrant, allowing the formation of many quadrilaterals. Relations of angles, perimeters, lengths of sides, etc., may be studied, 7" diameter.

Z-9160 ..... **(J—G)** **24.00**



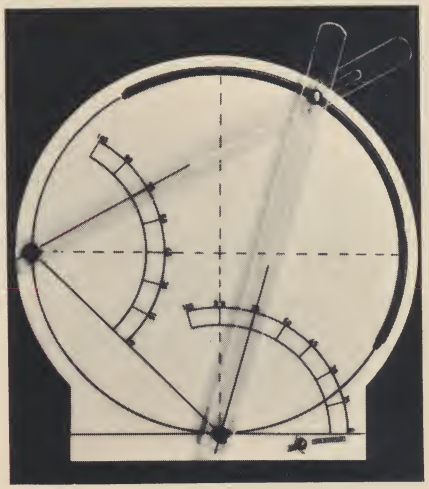
Z-9037



Z-9106

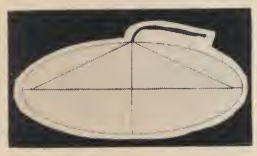
TRIANGLE, ANGLE BISECTOR — A valuable aid in demonstrating the theorem: The bisector of an angle divides the opposite side in the same ratio as the including sides. One side is adjustable. 14" expanded.

Z-9148 ..... **18.00**

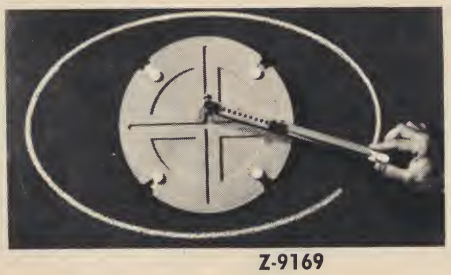


CHORD, TANGENT ANGLE — Shows angles formed by two chords and by a tangent and a chord. Chords are flexibly anchored at one end on circle and may be moved to several positions to investigate the angle between them. Disc is 9" diameter.

Z-9165 ..... **19.50**



Z-9168



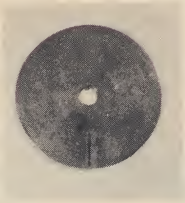
Z-9169

ELLIPTICAL BLACKBOARD COMPASS — Fastens to blackboard by suction cup. Chalk holding arm pivots at two points controlled in vertical and horizontal slots in plastic discs; diameter 10".

Z-9169 ..... **(J—G)** **23.50**

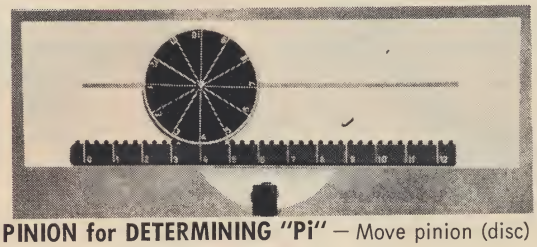
ELLIPSE, BY STRING — The ellipse is the locus of a point which moves so that the sum of its distances from two fixed points is constant. A loop of thread is secured at the foci. The loop is kept tight in tracing out the ellipse. The axes are 7½" and 3½".

Z-9168 ..... **(G)** **6.00**



DETERMINING "PI" — Measure around and across this three inch disc with string. Divide the circumference by the diameter for an approximate value for "Pi".

Z-3911 Disc ..... **(U—J)** ..... **.80**



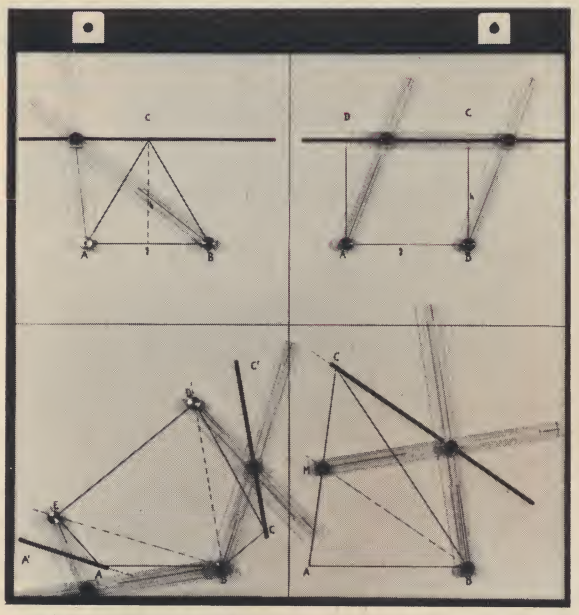
RACK and PINION for DETERMINING "Pi" — Move pinion (disc) along rack (scale) to measure circumference of disc. (Both are divided into 12 equal sections.) Then divide circumference by diameter for approximate value of "Pi". (Mount using rod and tripod Z-9064 & Z-9065.)

Z-9164 ..... **14.25**

Geometric Transformations

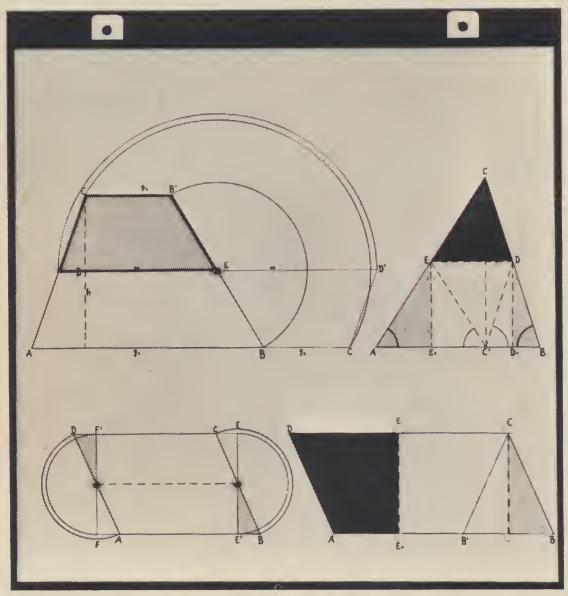
THE MODERN APPROACH TO GEOMETRY

Classroom-Size Animation Boards



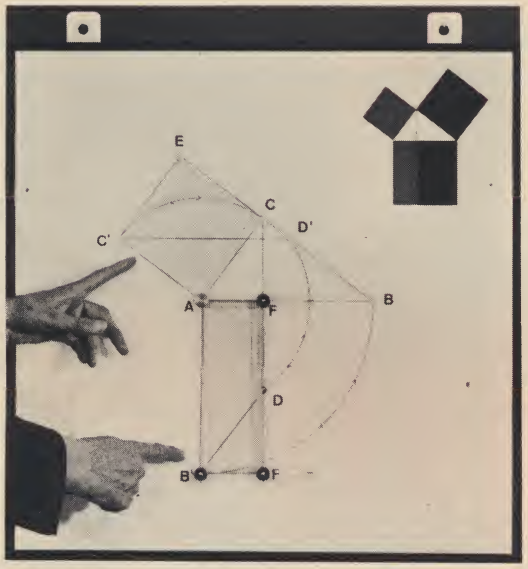
AREA TRANSFORMATION BOARD — The basic concept of the area or shear transformation is impressively illustrated by manipulation of four figures which have movable parts. Triangles with common base and equal heights are a special case. Board is 27½ inches square (70 x 70 cm).

Z-9751 ..... **105.00**



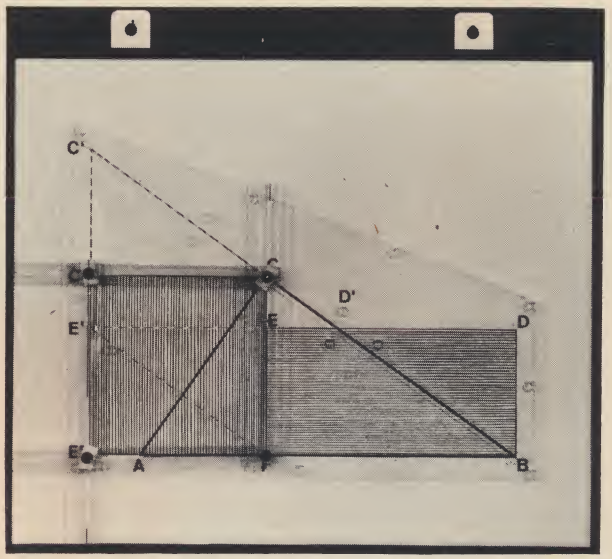
AREA AND ANGLE THEOREM BOARD — Rotations and reflections are employed to develop useful formulas. Areas of the trapezoid and the parallelogram, and the angle sum of a triangle are treated. Board is 27½ inches square (70 x 70 cm).

Z-9752 ..... **105.00**



PYTHAGOREAN THEOREM BOARD — Area transformation and rotations are used to prove this famous theorem. One-half of the proof is given, the other half being the same. Each half of the proof also demonstrates the theorem that each leg of a right triangle is the mean proportional between the hypotenuse and the non-adjacent segment of the hypotenuse. Board is 27½ inches square (60 x 60 cm).

Z-9754 ..... **105.00**



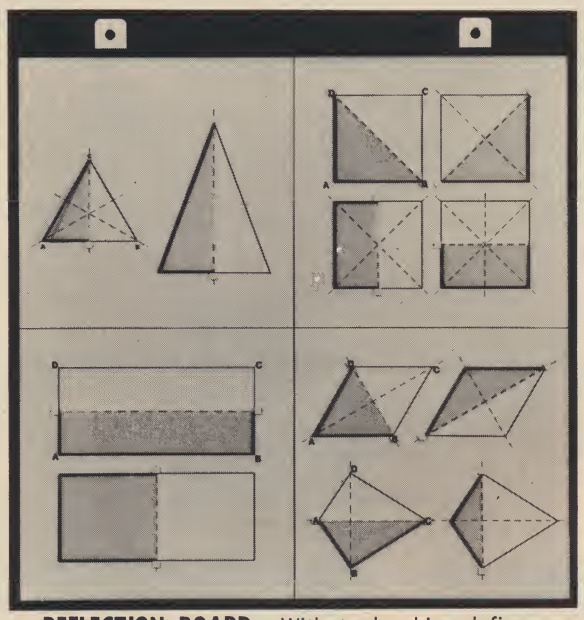
ALTITUDE THEOREM BOARD — Area transformations are utilized in the proof that in a right triangle the altitude is the mean proportional between the segments of the hypotenuse. Board is 23½ inches square (60 x 60 cm).

Z-9755 ..... **105.00**

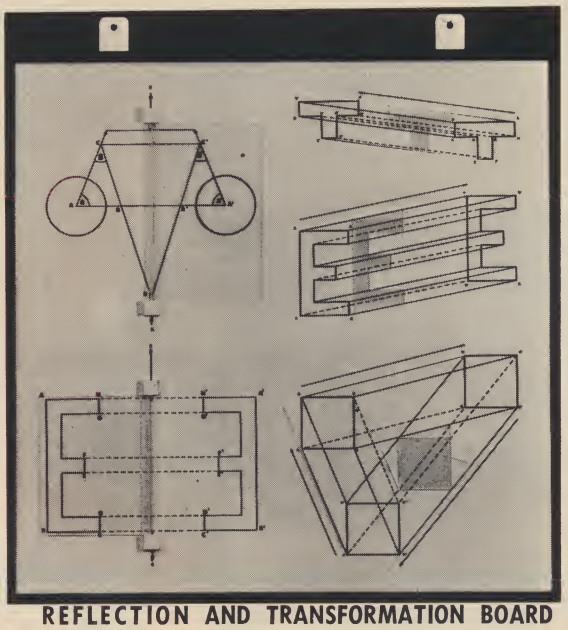
THE MODERN APPROACH TO GEOMETRY

Geometric Transformations

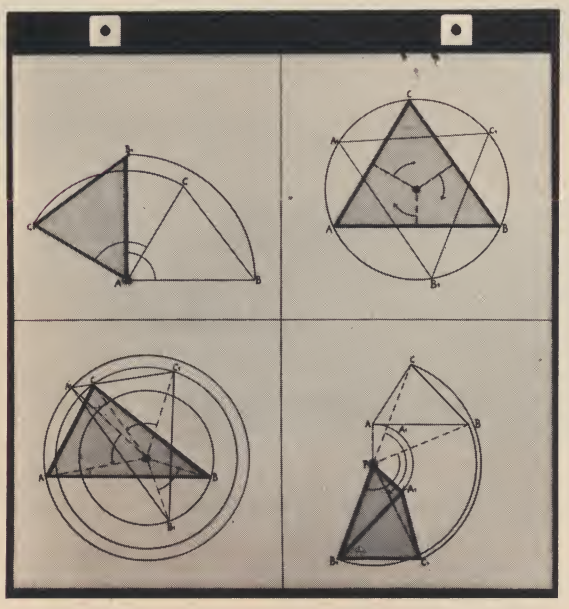
The "New Look" in Geometry! Transformations which slide, reflect, rotate, and expand figures in the plane are now considered a valuable extension of the conventional Euclidean Geometry course. The models shown below (and on page B) each demonstrate one of the principles of transformation or an application of these principles for the proof of a theorem, displayed in its natural simplicity. Involved verbal descriptions and static, laborious blackboard sketches are replaced by active visual demonstrations that convey their meanings quickly and clearly. Each board is made of rigid, durable plastic which may be marked with a grease pencil or marking pen. Geometric figures are cut from brightly colored plastic sheet and mounted for easy manipulation during the demonstration. All necessary lines are permanently imprinted.



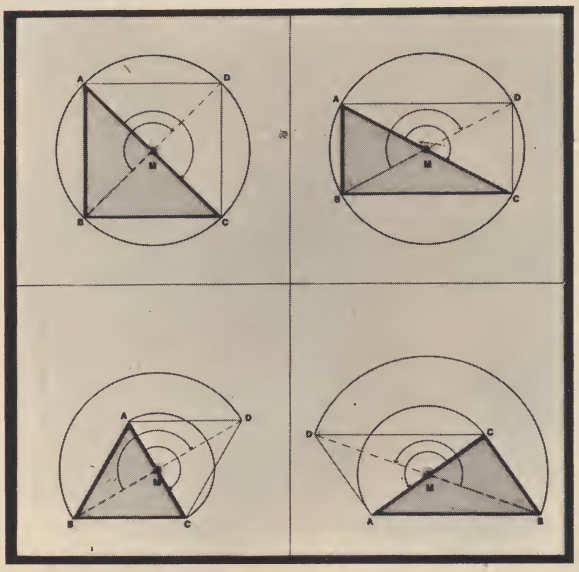
REFLECTION BOARD — With twelve hinged figures which may be flipped to show the reflection transformation, axes of reflection, and symmetries about a line. Board is 27½ inches square (70 x 70 cm).
Z-9747 ..... **90.00**



REFLECTION AND TRANSFORMATION BOARD — Two of the five geometric figures are hinged to show the effect of reflection of points, lines, angles, etc. The other three figures are movable along straight lines to show the translation transformation. Board is 27½ x 29½ inches (70 x 75 cm).
Z-9748 ..... **115.00**



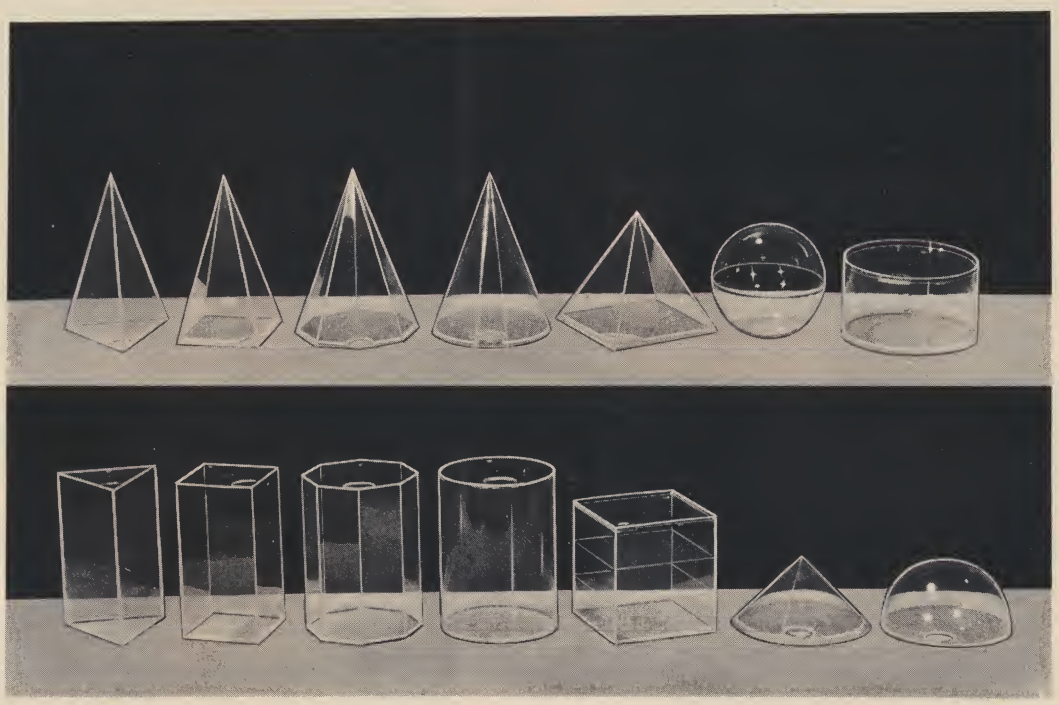
ROTATION BOARD — Triangles ABC are transformed into triangles A'B'C' by rotation about centers with different positions in relation to the triangles. General and specific cases are illustrated. Board is 27½ x 29½ inches (70 x 75 cm).
Z-9749 ..... **105.00**



HALF-TURN BOARD — This board illustrates the special case of a rotation transformation for an angle of 180° (which is called the half-turn). Each of the triangles is transformed by a half-turn about the midpoint of one side. Board is 27½ inches square (70 x 70 cm).
Z-9750 ..... **105.00**

VOLUME

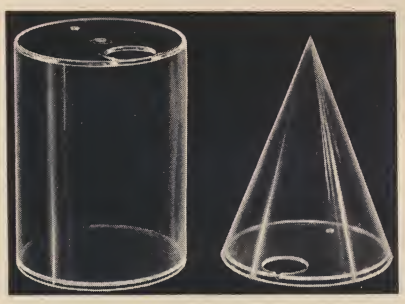
These transparent, durable plastic shapes may be filled with colored water, rice or sand to illustrate volume relationships, by pouring from one to another. Recessed bottoms prevent marring.



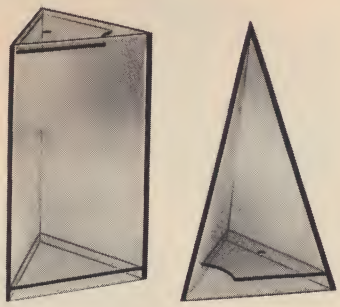
14 PIECE VOLUME DEMONSTRATION SET — BEAUTIFULLY FINISHED

The set consists of all the consistently used "regular" shapes and serves to familiarize the student with the descriptive terminology. All are clear plastic and the square pyramid, short cylinder, cube, cone and hemisphere have colored bases. The sphere is 4" in diam.; the cone, hemisphere and short cylinder are each nearly 5" in diam., and have altitudes equal to their base radii. The cube and square pyramid are each 4" high; the other eight are all over 6" high, and matching pairs have congruent bases.

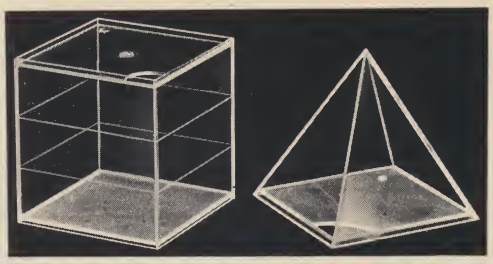
Z-9095 ..... Set **55.00**
U—J—A—G



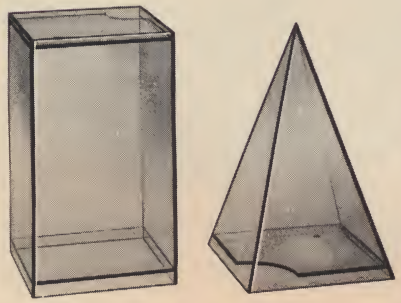
Z-9120



Z-9183



Z-9118



Z-9184

ILLUSTRATING 3:1 VOLUME RELATIONSHIP

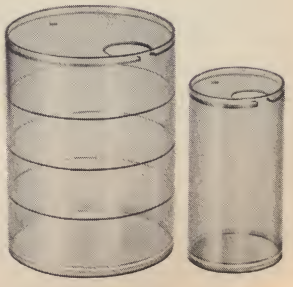
With identical bases and the same altitude, the four pairs, above and to the left, can demonstrate that the volume of the tapered member is only one third that of its mate.

Z-9120	CONE & CYLINDER	**7.50**
Z-9118	CUBE & PYRAMID	**9.00**
Z-9183	TRIANGULAR PRISM & PYRAMID	**12.50**
Z-9184	SQUARE PRISM & PYRAMID	**14.50**

ILLUSTRATING 4:1 VOLUME RELATIONSHIP

The two hollow cylinders shown at right are used for volume measurement. The larger of the two has a height of 200 mm and can be filled to hold 1 liter of liquid. The smaller cylinder is 160 mm high and holds ¼ liter when filled. Volumes are in the ratio of 4:1.

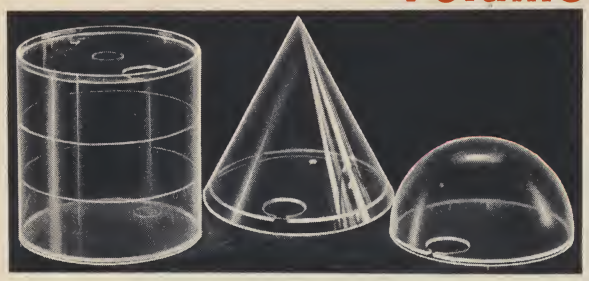
Z-9109 ..... Per Set **15.50**
U—J—A—G



Z-9109

L-Lower elementary. U-Upper elementary. J-Junior high school. A-Algebra. G-Geometry. T-Trigonometry.

Volume Study Sets

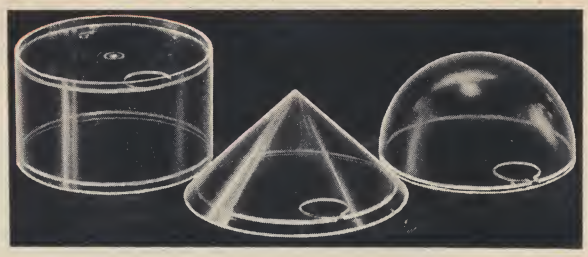


Z-9116

CYLINDER, CONE AND HALF SPHERE with same base. Height of cylinder and cone is same as diameter of bases, that of half sphere equals the radius of the base. Thus ratio of Cone : Half sphere : Cylinder = 1 : 2 : 3.

Z-9116 ..... Set **14.25**

1:2:3 Volume Ratio



Z-9075

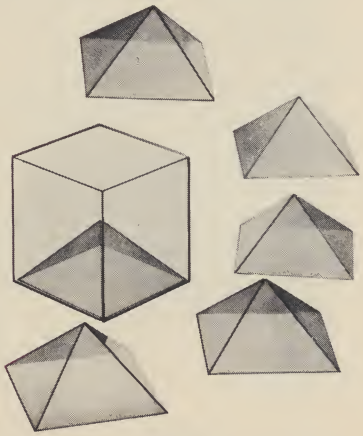
CYLINDER, CONE AND HALF SPHERE with same base, and height which is equal to radius of the base. Thus the volume ratio is Cone : Half Sphere : Cylinder = 1 : 2 : 3.

Z-9075 ..... Set **12.25**

Z-6210

CONE, SPHERE, AND CYLINDER have same diameter, and height of cone and cylinder is the same as diameter. Aluminum cylinder will hold three aluminum cones full of liquid, but if plasticized wooden sphere is placed in cylinder first, only one cone full of liquid can be added. Thus the ratio is demonstrated.

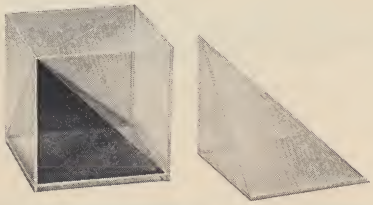
Z-6210 ..... Set **8.00**



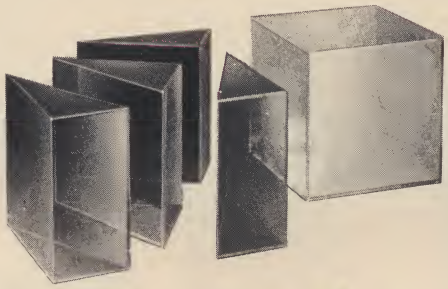
Z-9732

CUBE WITH INTERNAL PYRAMIDS — Consists of cube and 6 brightly colored square pyramids, for teaching volume formula of pyramids (V = 1/3 Bh) in a natural way.

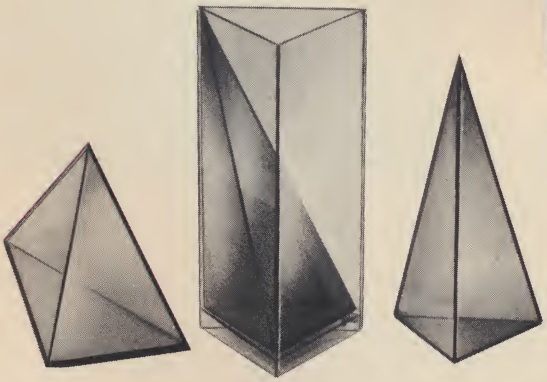
Z-9732 ..... **23.00**



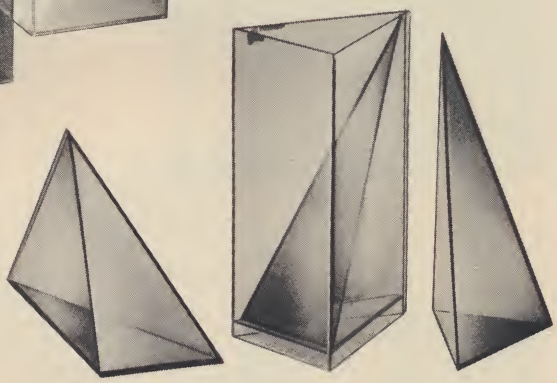
Z-9188



Z-9176



Z-9186



Z-9155

PYRAMIDS WITHIN PRISMS

Removable interior pyramids permit demonstrating volume formulas more easily than with drawings. Sturdy transparent colored plastic, significant, beautiful, durable. Cubes are approx. 4" high, prisms approx. 8" high.

Z-9188 TRISECTIBLE CUBE **12.00**

Z-9176 QUADRISECTIBLE CUBE (Interior Prisms) **20.50**

Z-9186 TRISECTIBLE PRISM, EQUILATERAL **14.50**

Z-9185 TRISECTIBLE PRISM, EQUILATERAL. Like Z-9186 but interior pyramids are not removable **12.50**

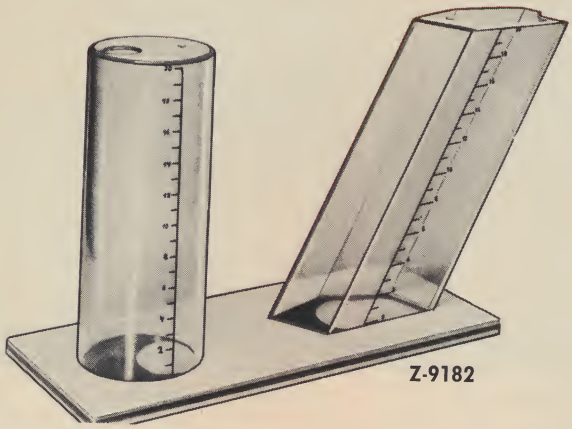
Z-9155 TRISECTIBLE PRISM, SCALENE **20.00**

U—J—A—G

L-Lower elementary. U-Upper elementary. J-Junior high school. A-Algebra. G-Geometry. T-Trigonometry.

CAVALIERI'S PRINCIPLE

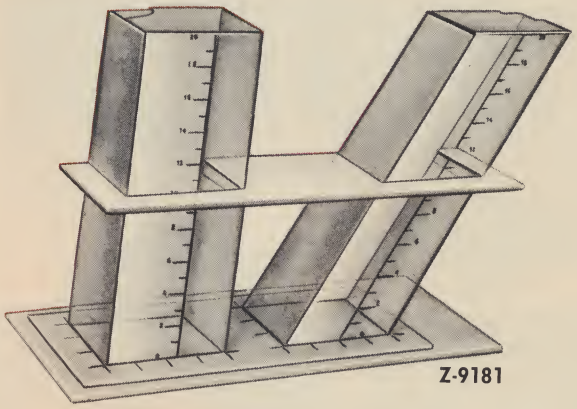
Solids Lying Between Parallel Planes Have Equal Volumes If All Planes Parallel To The Bounding Planes Cut Equal Sections Of The Solids.



Z-9182

CYLINDER AND OBLIQUE PRISM — Sand in the hollow base can fill either the cylinder area or the prism base area proving the bases have equal areas. Cylinder and prism are both removable and have openings for filling. Comparison shows both shapes contain equal volumes of liquid or sand if filled to the same height. Base is 11⅞ in. long, (30.16 cm); 3 11/16 in. wide, (9.37) cm). Cylinder and prism 8 in. high, (20.32 cm).

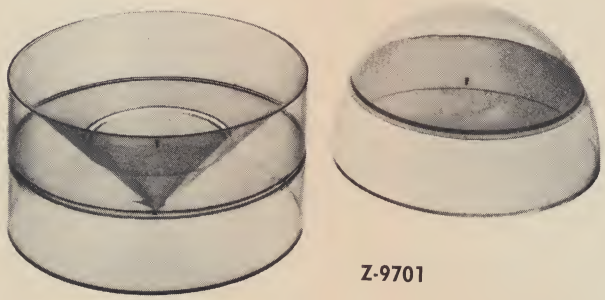
Z-9182 ..... **42.00**



Z-9181

SQUARE PRISMS — This model demonstrates the case of a right prism and an oblique prism with congruent bases. The prisms are removable for measurement and have height graduations. They demonstrate that equal amounts of liquid fill the hollow prisms to the same height whether the prism is right or oblique. Base is 11⅞ in. long, (30.16 cm); 4⅝ in wide, (11.75 cm). Prisms are 8⅛ in. high, (20.64 cm).

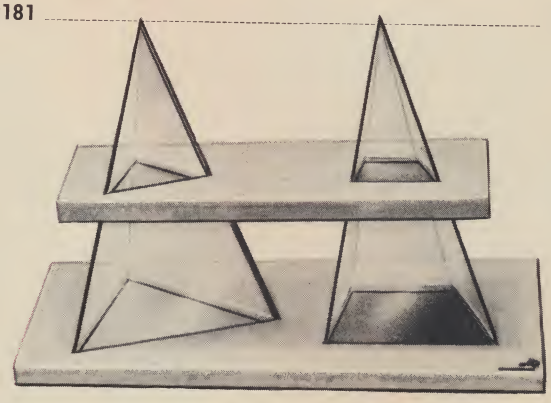
Z-9181 ..... **25.50**



Z-9701

CAVALIERI THEOREM SET — A large, attractive model for demonstrating the volume of a hemisphere, which is equal to the volume of the cylinder minus the volume of the cone, by using Cavalieri's Theorem. Consists of cylinder, cone and hemisphere. Cylinder and hemisphere are dissectible; cone is removable from the cylinder, which has a cone-shaped inner wall. Cylinder and sphere are 9½" diameter (24 cm).

Z-9701 ..... **73.00**



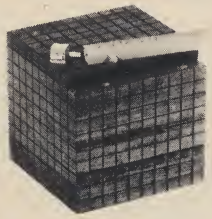
PYRAMIDS — This model illustrates Cavalieri's Principle for the special case of pyramids. Sand in base can fill base area of either pyramid to prove that both pyramids have equal areas. Accordingly, since the heights are equal, the volumes are equal. A second sand-filled cross-section shows that at the same height, the cross-sectional areas are also equal.

Z-9449 ..... **57.00**

Z-8850

CUBIC FOOT — Constructed of sturdy, varnished plywood. Three sides are graduated in square inches with alternating inches painted a contrasting color. One side is removable to permit storing small items inside.

Z-8850 ..... **13.50**



Z-3901

ONE KILOGRAM LITER BLOCK — Made of wood, dissectible into three parts. Weight of 1 kilo illustrates relation of weight to volume.

Z-3901 ..... **U—J—A—G** **9.00**

Z-3910

Z-3900

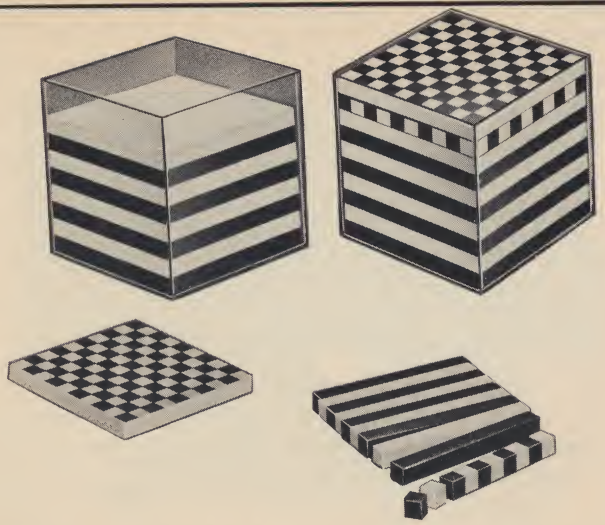
LIQUID MEASURES

These sturdy metal measures are useful in teaching both systems of liquid measure and in estimating volume.

Z-3910 METRIC One ea. 10, 20, 50, 100, 250, 500 ml & 1 liter **10.00**

Z-3900 ENGLISH One ea. gallon, half gallon, quart **11.70**

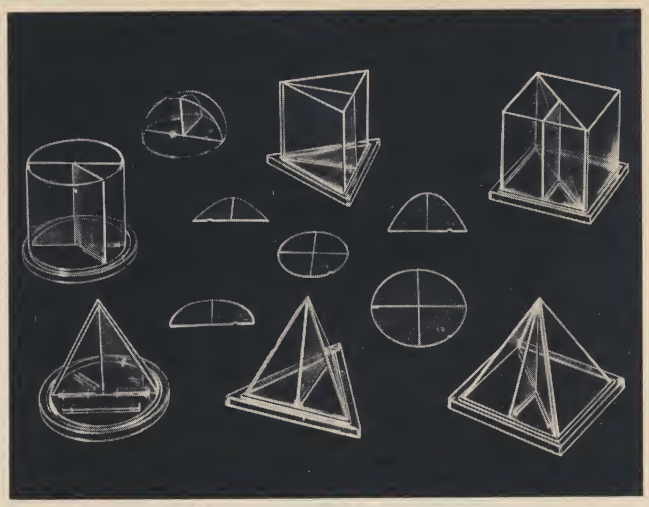
L-Lower elementary. U-Upper elementary. J-Junior high school. A-Algebra. G-Geometry. T-Trigonometry.



DISSECTIBLE LITER BLOCK — This cube, 10 cm on an edge, may be dismantled to make clear the fundamental nature of a volume formula. The top layer separates into nine 10x10x100 mm pieces and ten 1x1x1 cm pieces. Another layer is marked in 1 cm squares. Volume, area and perimeter formulas are illustrated and the metric system introduced.

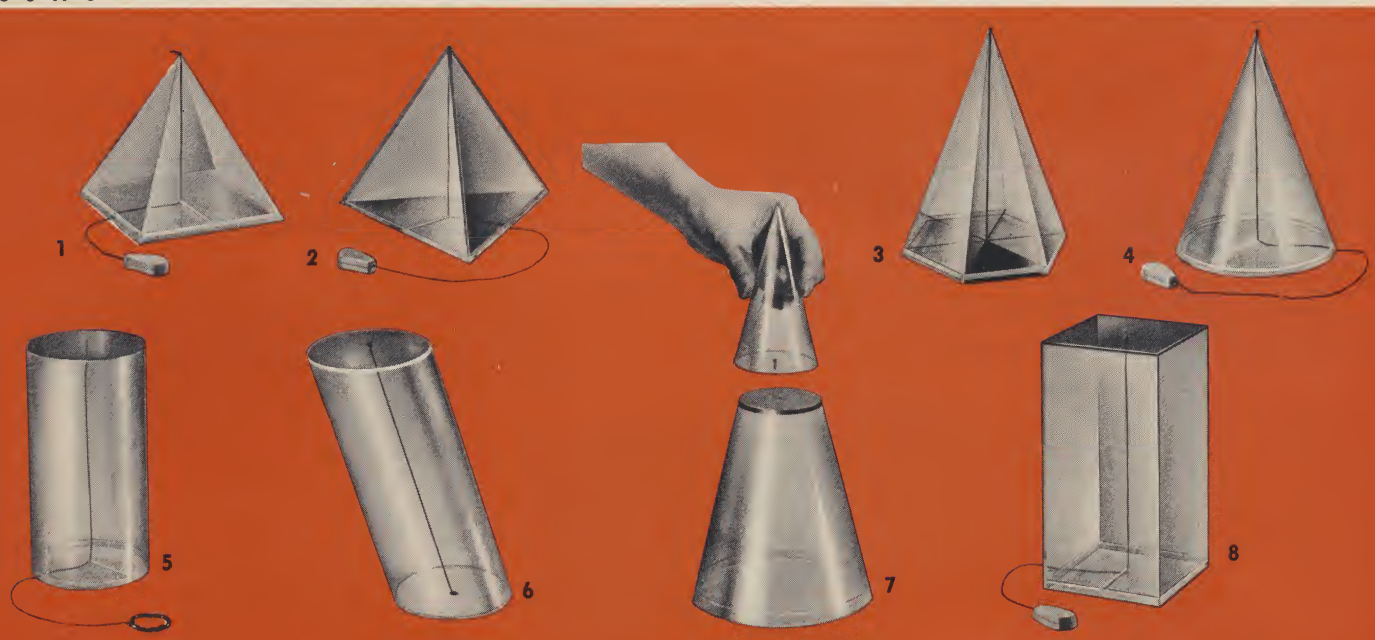
Z-9112 ..... **8.00**

U—J—A—G



LaPINE SAGE KIT® — **Student Applied Geometry Experiment Kit.** Enables your students to make their own geometry models in seconds. Teach **Terminology** (each set contains pyramids, prisms, cone, cylinder, hemisphere, cube, and 15 sections which fit the three bases). Students perform **Volume** experiments (shells may be filled with liquid). **Area study** and **Dimensions** may be studied. Set includes manual and storage case. **See Sage Kit on full color pages!**

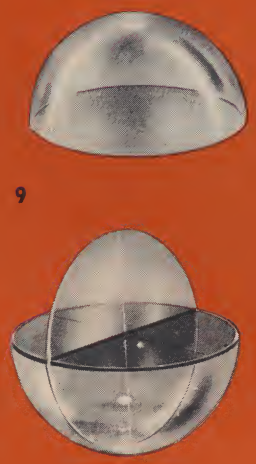
Z-5000 ..... **only** **8.95**



BASIC MATH MODEL SET

This set of nine new transparent plastic math models adds both impact and clarity to the math class! Colored bases or sides are highlighted against transparent plastic bodies. The set includes one each of the following:

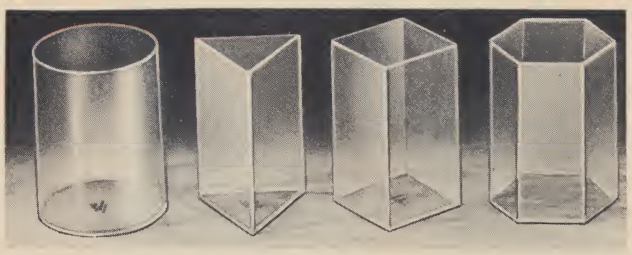
1. **Square Pyramid**—4½" high, with movable altitude and colored recessed base.
2. **Triangular Pyramid** — 5" high, with movable altitude and one colored side face.
3. **Hexagonal Pyramid** — 6" high, with altitude and marked diagonals on base for computing area.
4. **Cone** — 6⅛" high, 3¼" diameter, with movable altitude and colored transparent base.
5. **Cylinder** — 6" high, 3¼" diameter, with movable altitude.
6. **Oblique Cylinder** — 7" high 3¼" diameter, with permanently fixed altitude shown by colored cord. Colored base. Set in oblique position.
7. **Two-Piece Cone** — 10½" high. Horizontal section separable into small and truncated cones.
8. **Square Prism** — 5⅞" high, with movable altitude and colored base.
9. **Sphere Surface Area** — 4¾" diameter. Two hemispheres, one intersected by two circular planes passing through its center.



Z-9730 Set of 9 Models **49.50**

Geometric Solids

Basic Sets of Attractive, Accurate Plastic or Wood Figures

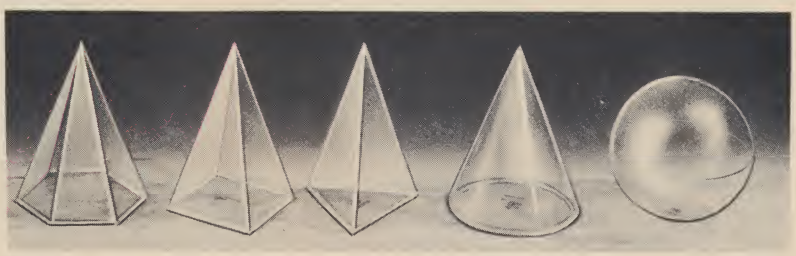


SIMPLE SOLIDS SET

A complete set of nine simple solids in distinctive colors. These solids are frequently found in our three-dimensional world. Their presence in a hall display case or classroom reminds students and visitors alike of our mathematical world. These six inch models are just right for display or classroom demonstration. (Sphere's diameter is 4"). An inexpensive way to make your school mathematics conscious.

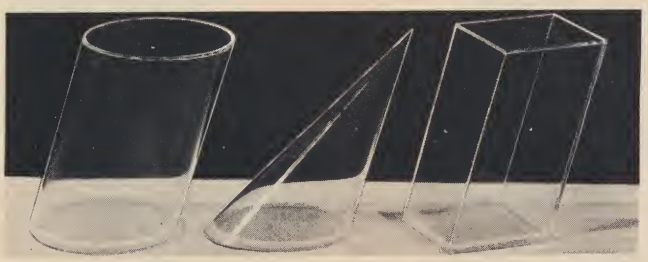
Z-9063 ..... **42.50**

See Set Z-9063 on Full Color Pages



Z-9063

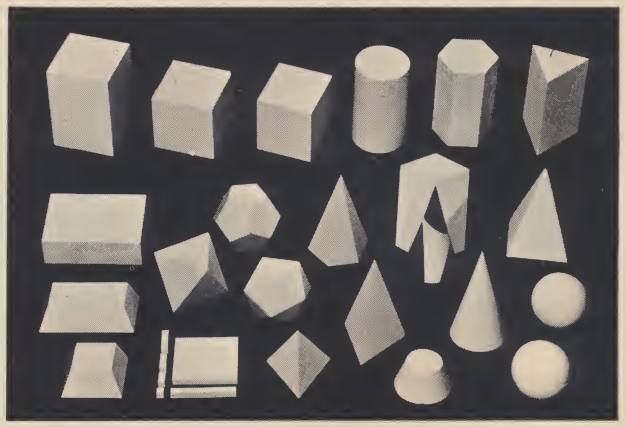
Most of the solids on this page are large enough for demonstration purposes—all are small enough to pass around for individual or small group study. Let your students handle these models—don't neglect the tactile dimension in your teaching aids!



Z-9028

OBLIQUE SOLIDS SET — Cylinder, prism, and cone in clear plastic with contrasting, brightly colored bases. A logical supplement to set No. Z-9063.

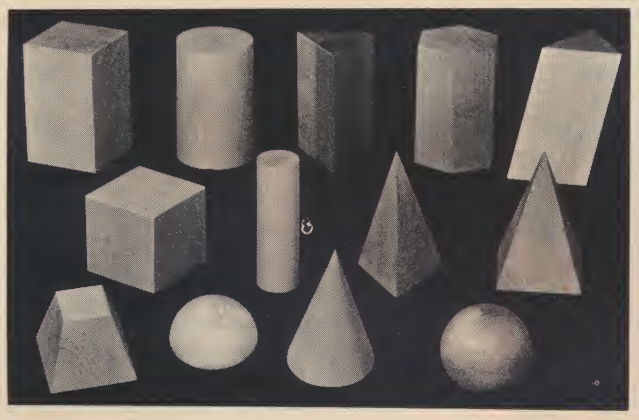
Z-9028 ..... **34.50**



Z-9035

DELUXE WOOD MODELS SET — Painted — Twenty-three large figures painted white for easy visibility at a distance. Includes dissectible cone. Size of cubes 4" on a side.

Z-9035 ..... **40.50**



Z-9030

MAPLE WOOD MODELS SET — Unpainted — Thirteen solid maple figures as shown. Size of cube is 2¾" on a side.

Z-9030 ..... **19.00**

Z-2930

HARDWOOD MODELS SET — Unpainted — Twenty-three hardwood models and 17 plane figures in transparent plastic box.

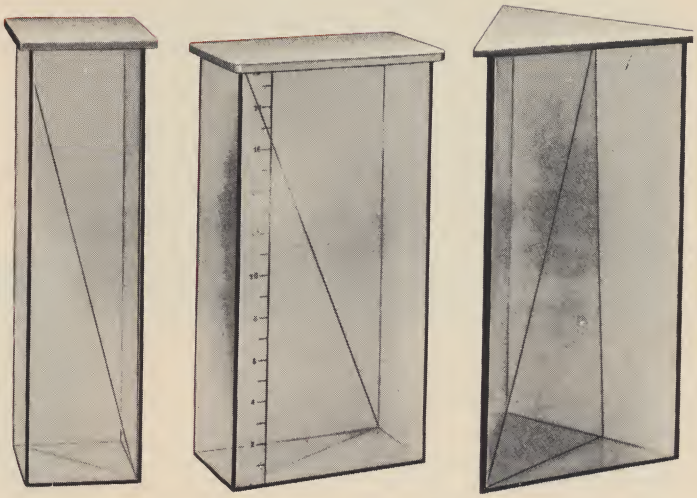
Z-2930 ..... **12.50**

L-Lower elementary. U-Upper elementary. J-Junior high school. A-Algebra. G-Geometry. T-Trigonometry.

Geometric Solids - Sections

Transparent Plexiglass

All the figures on this page are of transparent plastic and all have one or more sections, as detailed, to give a far better idea of the shapes and properties of the sections than would be possible otherwise. Cone Z-9408 and pyramid Z-9409 have fixed, non-removable sections. The others have removable sections, held in place by an opaque removable base or top. Useful in making calculations of angles, volumes, and diagonal lengths.



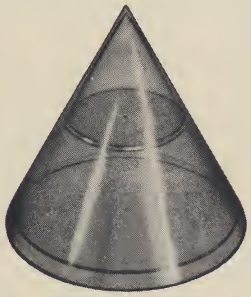
Z-9173 SQUARE PRISM Each **9.00**

Z-9174 RECTANGULAR PRISM Each **11.50**

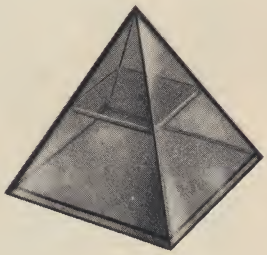
Z-9175 TRIANGULAR PRISM Each **11.00**

REMOVABLE SECTION PRISM SET — Each of the prisms in this group has a removable vertical section on which a diagonal is marked. Removable opaque tops. Prisms are about 8" tall. Each prism may be purchased separately as indicated.

Z-9666 Set of three models shown at right **28.50**
J—G—T



Z-9408

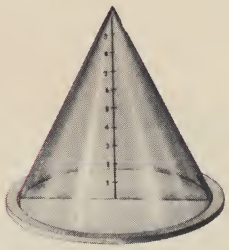


Z-9409

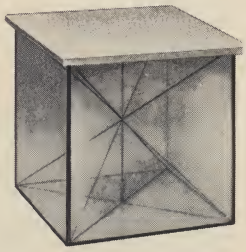
NON-REMOVABLE SECTIONS — Both cone and pyramid have non-removable sections parallel to the base.

Z-9408 CONE 5 inches in diameter and 5 inches high **6.00**
L—U—J

Z-9409 SQUARE PYRAMID 4 inches on base edge, 4 inches high. Each **6.00**
L—U—J—G



Z-9079



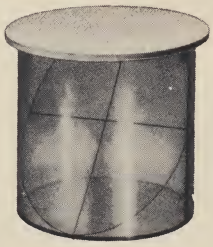
Z-9089

REMOVABLE SECTION CONE — The vertical section of this cone may be removed; altitude marked in centimeters. Height 4 inches. Removable opaque base.

Z-9079 ..... **U—J—A—G 9.00**

REMOVABLE SECTION CUBE — Has two diagonal walls each marked with diagonals. Cube 4 inches on edge. Removable opaque top.

Z-9089 ..... **J—A—G—T 15.00**



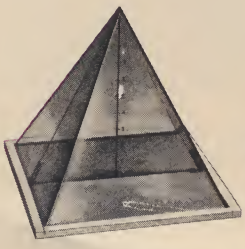
Z-9057

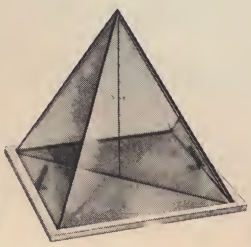
CYLINDER, REMOVABLE SECTIONS — Two views of this 4 inch high cylinder—one shows a vertical section on which altitude is marked, and the other a diagonal plane indicating an ellipse on which the axes are marked. Both sections are supplied. Removable opaque top.

Z-9057 ..... **U—J—A—G 14.50**

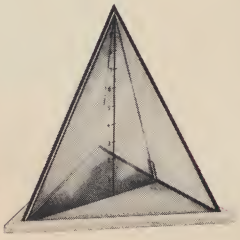
PYRAMID, REMOVABLE SECTIONS — Two views of this 4 inch high pyramid—one shows vertical section intersecting midpoints of opposite sides of base, and the other intersecting opposite corners. Both sections are supplied. Removable opaque base.

Z-9052 ..... **J—G 8.00**





Z-9052



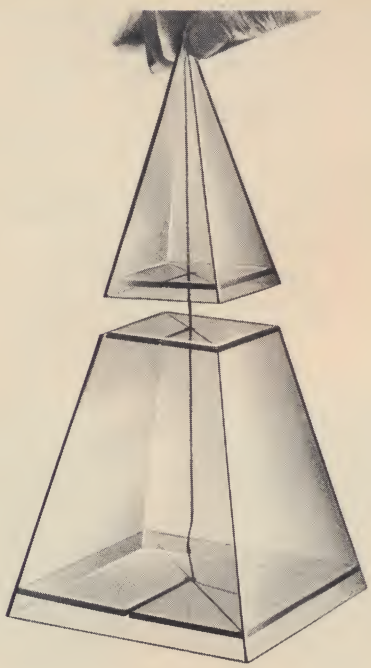
Z-9189

PYRAMID, REMOVABLE SECTION — This pyramid may be lifted from its opaque base to allow removal of vertical section marked with altitude.

Z-9189 ..... **J—A—G—T 10.00**

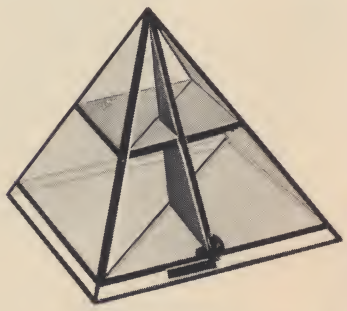
L-Lower elementary. U-Upper elementary. J-Junior high school. A-Algebra. G-Geometry. T-Trigonometry.

Pyramids



Z-9196

PYRAMID, MOVABLE AXIS — Dissectible; axis shows slant height, altitude. 8" high.
Z-9196 ..... (J—A—G—T) 7.50

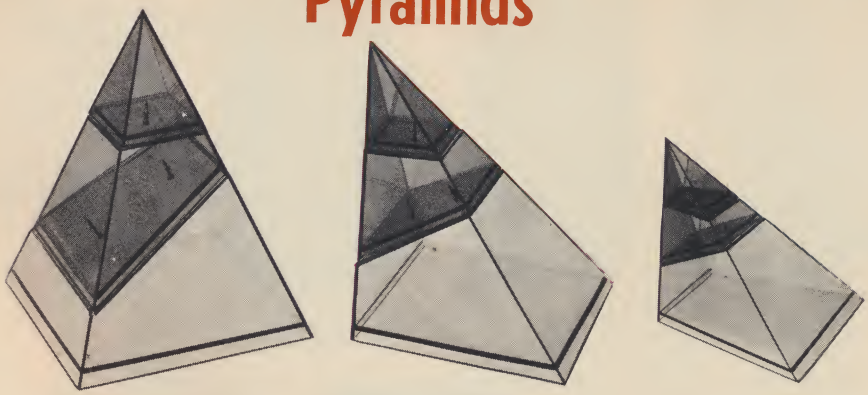


Z-9197

SQUARE PYRAMID, 2 VERTICAL, 1 HORIZONTAL SECTIONS—Not dissectible. 4½" high.
Z-9197 ..... (J—G) 13.00

FOLDUP PYRAMID (TRIANGULAR, SCALENE)— This model may be opened up so that its sides lie flat, hinged along the base. Model has fixed vertical sections, intersecting at the altitude of the pyramid and extending to the altitudes of respective sides. Part of one section is collapsible to facilitate angle study. Horizontal section (outlined only) is projected to base. About 4½ inches high.
Z-9039 ..... J—A—G—T 22.00

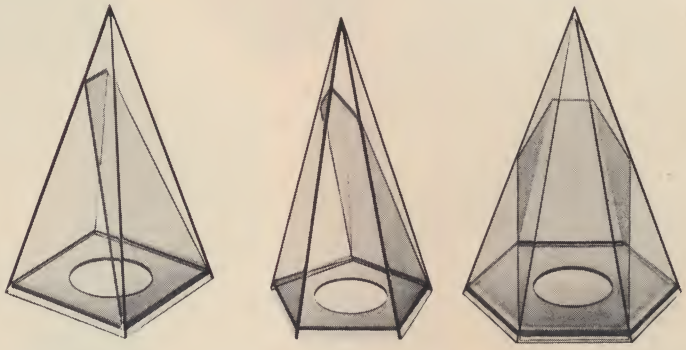
FOLDUP PYRAMID (TRIANGULAR, EQUILATERAL)— Like Z-9039, but with side-to-base angles equal. About 3½ inches high.
Z-9029 ..... J—A—G—T 25.00



Z-9061 Z-9060 Z-9062

DISSECTIBLE PYRAMID SET — Models are dissectible at both horizontal and oblique sections. One each of three as detailed below.
Z-9665 ..... Set of 3 ..... 47.50

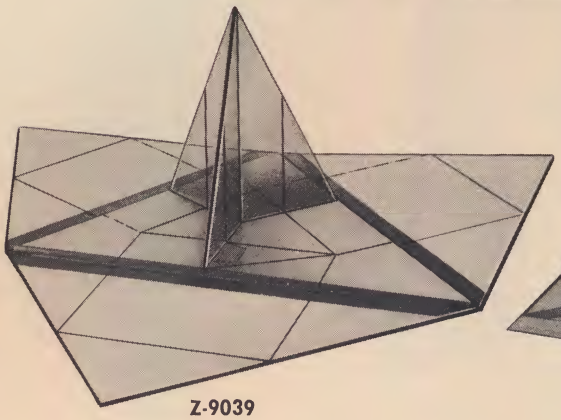
SQUARE RIGHT PYRAMID — With colored sections. 8 inches high.
Z-9061 ..... 16.50
SQUARE OBLIQUE PYRAMID — With colored sections. 6 inches high.
Z-9060 ..... 17.50
TRAPEZOIDAL OBLIQUE PYRAMID — With colored sections. 5 inches high.
Z-9062 ..... 18.50



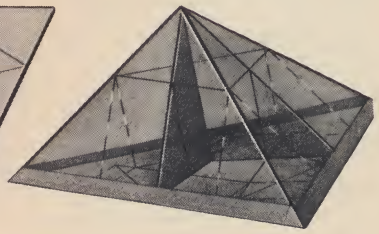
Z-9702 Z-9703 Z-9704

PYRAMID SET — The dissectible models in the set above have brightly colored removable sections which clearly show the intersections of planes and solids. The base of each model may be lifted out so that the section can be removed. Transparent plastic bodies. One each of 3 as detailed below.
Z-9668 ..... Per Set 25.00

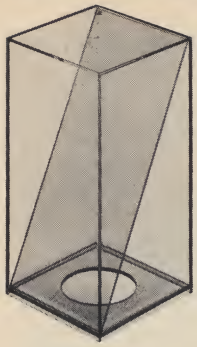
SQUARE PYRAMID — 8" (20 cm) high.
Z-9702 ..... 8.00
PENTAGONAL PYRAMID — 8" (20 cm) high.
Z-9703 ..... 9.00
HEXAGONAL PYRAMID — 8" (20 cm) high.
Z-9704 ..... 9.50

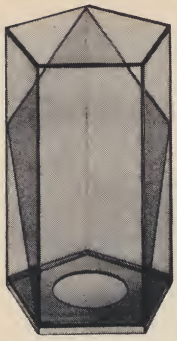


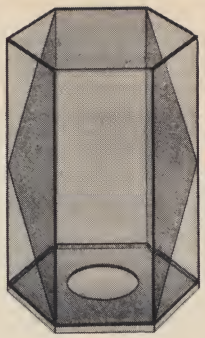
Z-9039



Z-9029


Z-9705


Z-9706


Z-9707

Prism and Pyramid Sets

These models have colored plane sections—oblique or horizontal—to show intersections of planes and solids. Some models are dissectible.

DISSECTIBLE PRISM SET

8" (20 cm) high. Base of each model may be lifted out for removal of the section. One each of the 3 models detailed below.

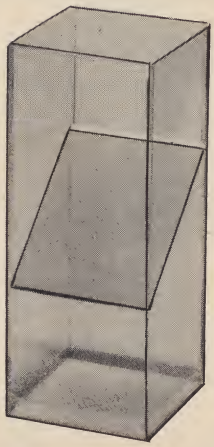
Z-9669	Set of 3	29.00
Z-9705	Square Prism	9.50
Z-9706	Pentagonal Prism	10.00
Z-9707	Hexagonal Prism	11.00

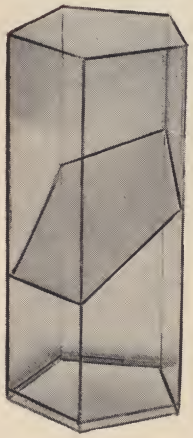
PRISM SET

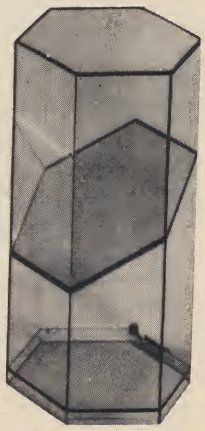
8" (20 cm) prisms with non-removable oblique sections. One each of 4 as detailed below.

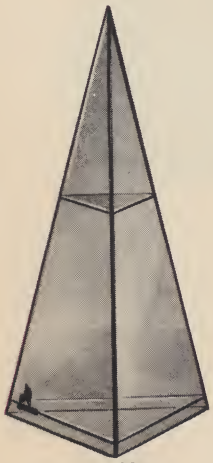
Z-9681	Set of 4	31.75
Z-9177	Triangular Prism	8.75
Z-9178	Square Prism	7.50
Z-9179	Pentagonal Prism	9.00
Z-9180	Hexagonal Prism	9.00

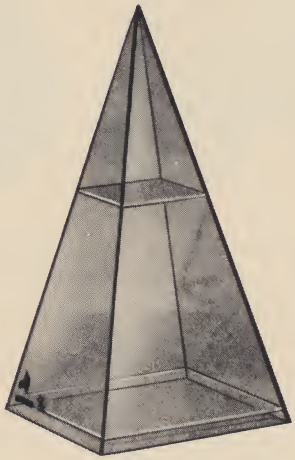
Z-9177

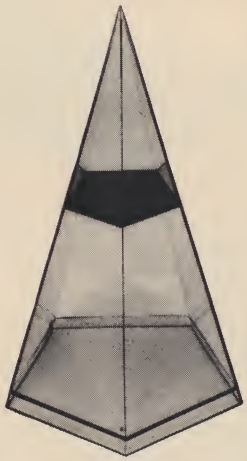

Z-9178

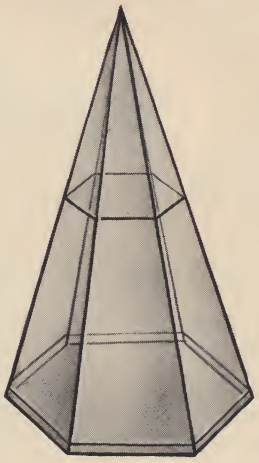

Z-9179


Z-9180


Z-9438


Z-9439


Z-9440


Z-9441

PYRAMID SET

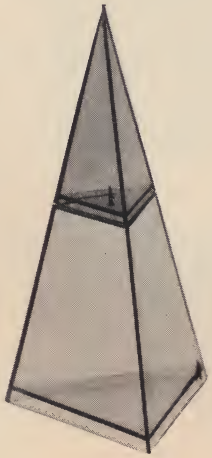
8" (20 cm) pyramids with non-removable horizontal sections. One each of 4 as detailed below.

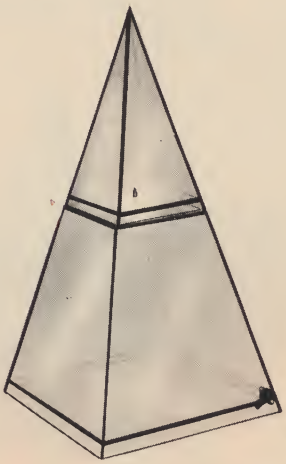
Z-9683	Set of 4	31.75
Z-9438	Triangular Pyramid	8.00
Z-9439	Square Pyramid	8.50
Z-9440	Pentagonal Pyramid	9.00
Z-9441	Hexagonal Pyramid	9.50

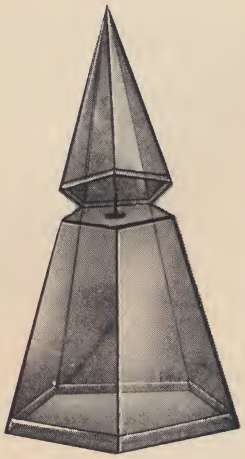
PYRAMID SET

Dissectible 8" (20 cm) pyramids each of which separates horizontally into a small pyramid and truncated pyramid. One each of 4 as detailed below.

Z-9684	Set of 4	35.50
Z-9194	Triangular Pyramid	8.25
Z-9195	Square Pyramid	10.00
Z-9437	Pentagonal Pyramid	11.00
Z-9435	Hexagonal Pyramid	10.00


Z-9194


Z-9195


Z-9437

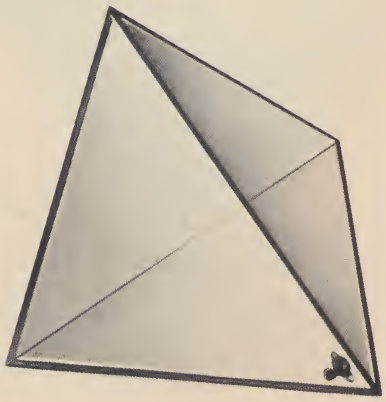
Z-9435

Polyhedrons

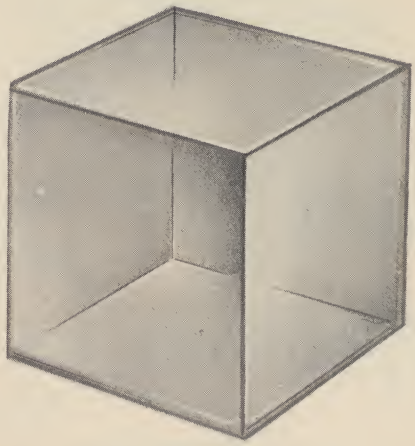
SET OF FIVE

Polyhedrons have been called the Building Blocks of the Greek World, the "Platonic Bodies." This set of five regular polyhedrons consists of one each of the following: **Z-9043** Tetrahedron; **Z-9070** Cube; **Z-9068** Octahedron; **Z-9103** Dodecahedron; **Z-9054** Icosahedron.

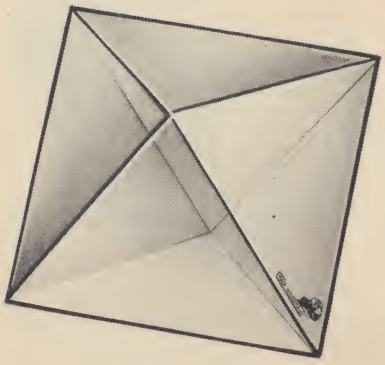
Z-9680 ..... Set of five **38.50**
J—G—T



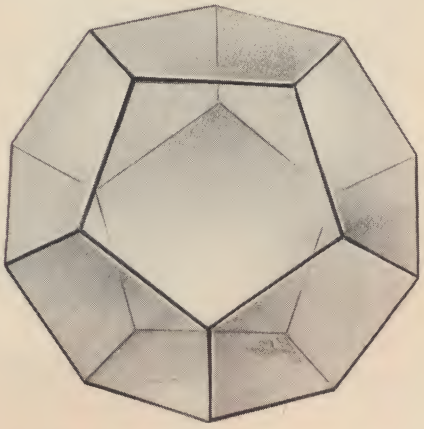
Z-9043 TETRAHEDRON—Edges 6" **4.50**
U—J—G—T



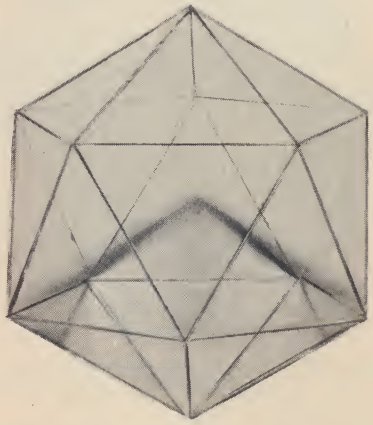
Z-9070 CUBE—Edges 4" **4.80**
U—J—A—G—T



Z-9068 OCTAHEDRON—Edges 6" **5.00**
J—G—T

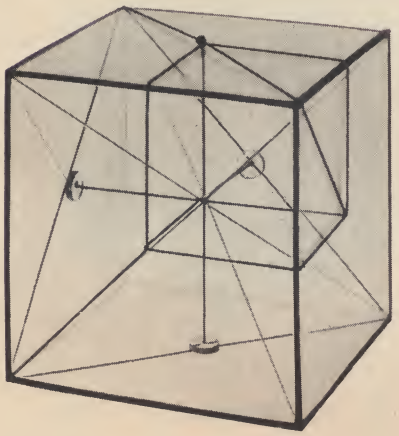


Z-9103 DODECAHEDRON—Edges 2" .. **14.75**
J—G—T

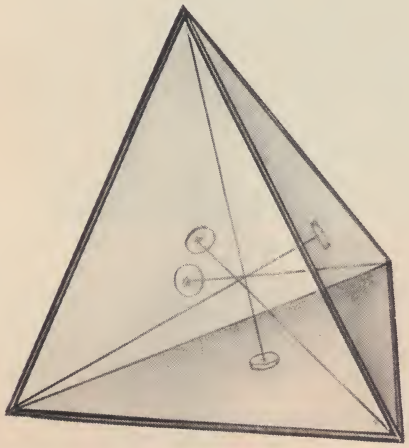


Z-9054 ICOSAHEDRON—Edges 2½" .. **13.50**
J—G—T

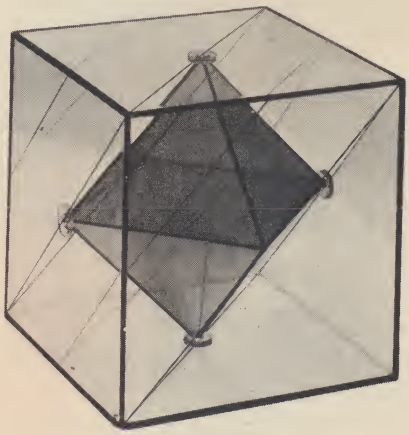
Drawings are difficult to make and verbal descriptions are often misunderstood, but these handsome transparent plastic models make crystal clear some of the concepts otherwise missed.



CUBE WITH DIAGONALS — Colored string indicates diagonals, altitudes, etc.
Z-9115 4" on side **12.50**
J—A—G—T

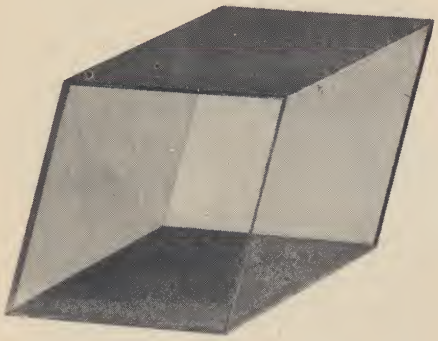


TETRAHEDRON, ALTITUDES — Tetrahedron with marked altitudes. Approximately 6 inches on a side.
Z-9076 ..... **(G—T) 10.00**

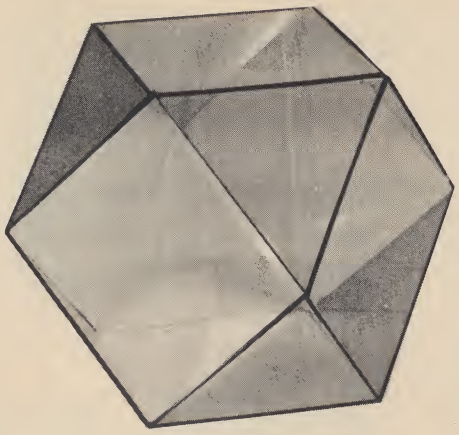


OCTAHEDRON IN CUBE — Octahedron inside hexahedron with various construction lines. Edges 4 inches.
Z-9074 ..... **(G—T) 20.00**

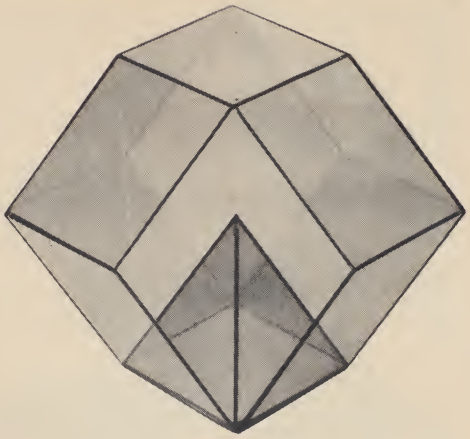
Polyhedrons



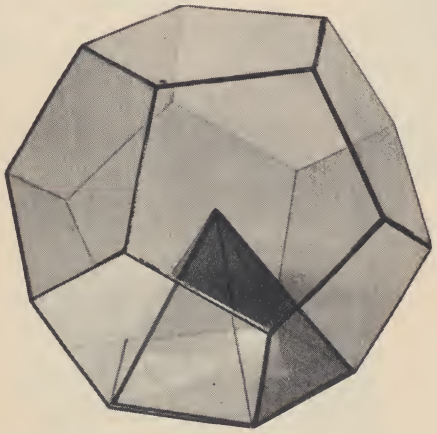
RHOMBOHEDRON — Each of six sides is a rhombus 3 inches on a side. Opposite sides same tint.
Z-9419 ..... **9.00**
G



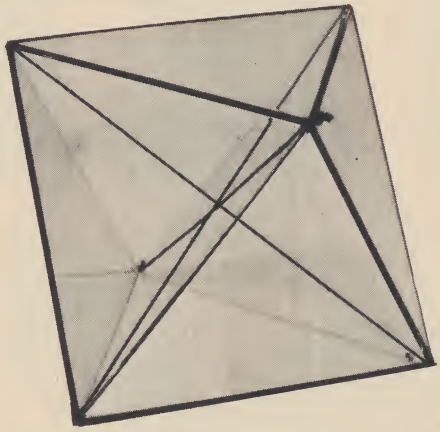
CUBE OCTAHEDRON — Semi-regular polyhedron of 6 squares and 8 equilateral triangles, 2½" on a side.
Z-9073 ..... **10.50**
J—G—T



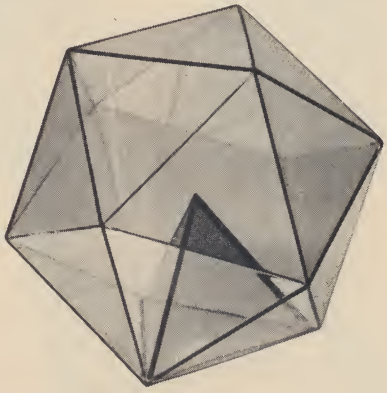
RHOMBIC DODECAHEDRON — The faces are rhombuses, 2¼" on an edge. A colored pyramid rests on the base and may be used for finding volume.
Z-9133 ..... **16.00**
G—T



DODECAHEDRON — Each of the 12 sides is a regular pentagon 1¾" on a side. Colored pyramid on base, inside.
Z-9124 ..... **17.00**
J—G—T

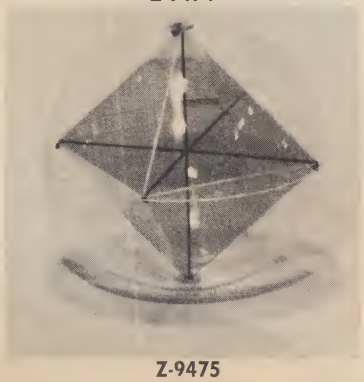


OCTAHEDRON — Each of the 8 sides is an equilateral triangle about 6" on a side. Diagonals are indicated with string.
Z-9055 ..... **12.00**
J—A—G—T

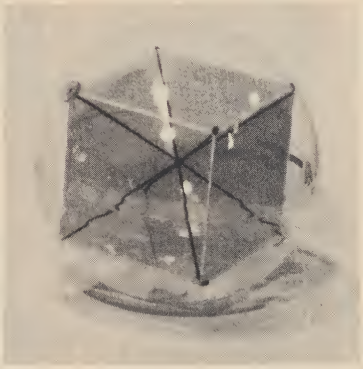


ICOSAHEDRON — Each of the 20 sides is an equilateral triangle approx. 2¼" on a side. Colored pyramid on base, inside.
Z-9129 ..... **16.00**
G—T

Z-9474



Z-9475



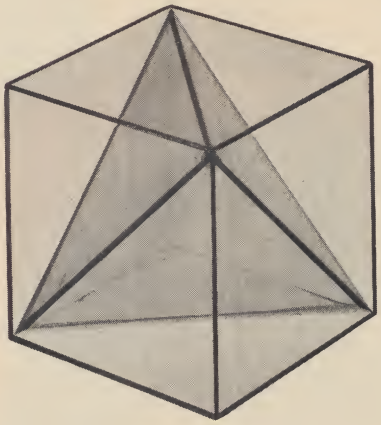
Z-9476

POLYHEDRONS INSCRIBED IN 4¾" SPHERES

TETRAHEDRON—With altitudes indicated.
Z-9474 ..... **16.00**

OCTAHEDRON—With altitudes indicated.
Z-9475 ..... **26.50**

CUBE—With altitudes indicated.
Z-9476 ..... **17.50**
G—T

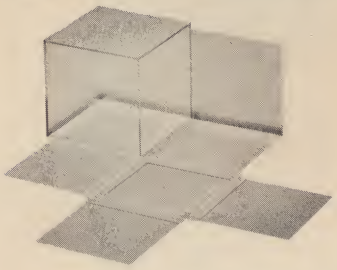


TETRAHEDRON INSCRIBED IN A CUBE

Cube is clear plastic, tetrahedron is brightly colored. Edge of cube 4" (10 cm).
Z-9727 ..... **17.50**

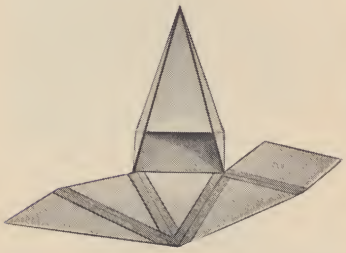
L-Lower elementary. U-Upper elementary. J-Junior high school. A-Algebra. G-Geometry. T-Trigonometry.

Lateral Area



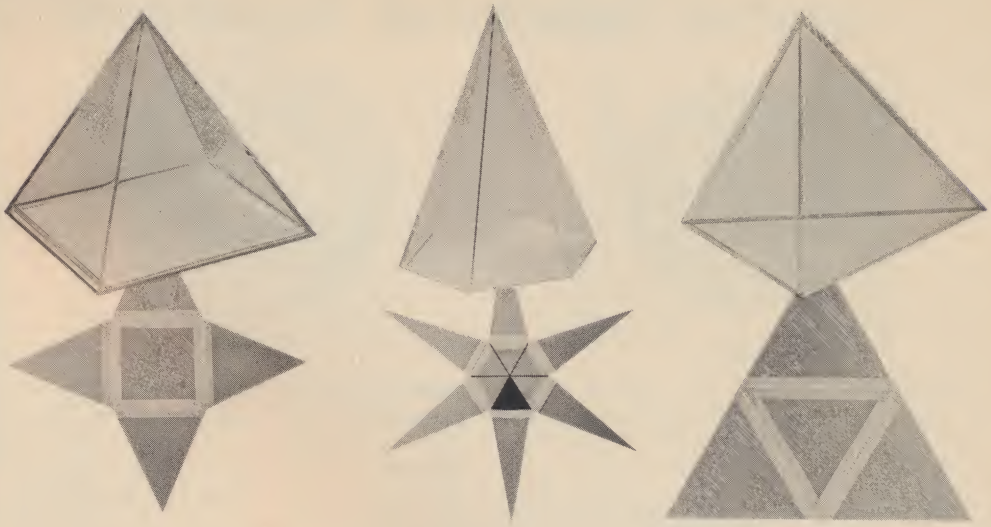
Z-9110

CUBE WITH LAYOUT — A clear plastic cube plus a layout of the surface. Clearly demonstrates the area formula. 4" on edge.
Z-9110 .....(U—J—A—G) **9.50**



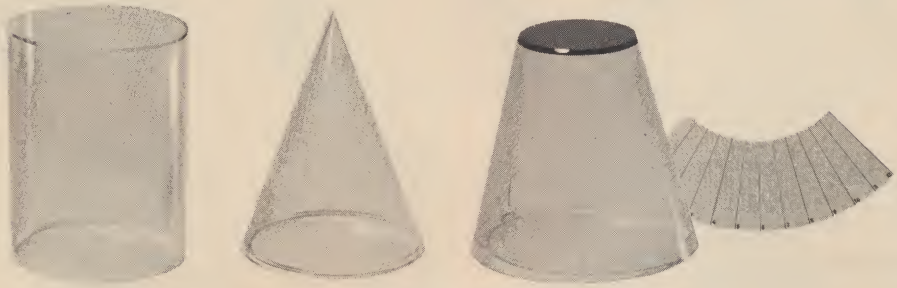
Z-9191

SIX INCH PYRAMID WITH LAYOUT — Clear plastic square pyramid encloses colored plastic hinged layout of total surface. Makes lateral area formulas easy.
Z-9191 .....(J—A—G) **13.50**



LATERAL AREA SET I

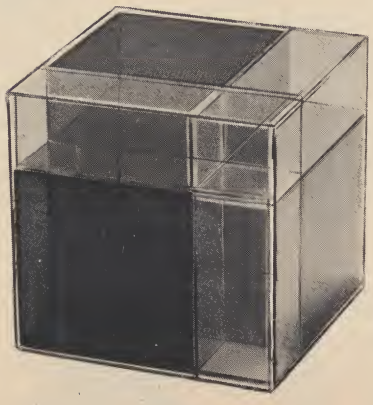
ANGULAR. Three pyramids whose sides may be laid out flat to show lateral areas and to minimize confusion about altitudes, edge length, slant height etc. Altitudes 4" to 6", sides hinged to bases.
Z-9660 .....(J—A—G—T) **27.50**



LATERAL AREA SET II

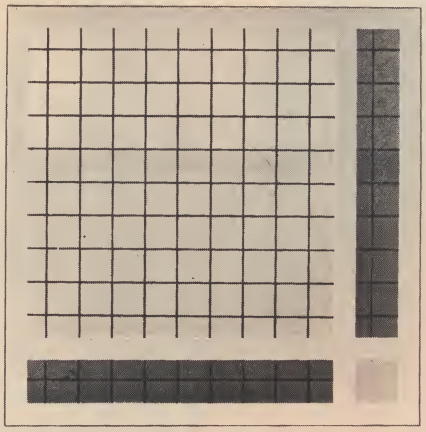
CIRCULAR. Cylinder, cone and frustum of cone, each with flexible plastic template showing lateral area. Base may be removed, insert slipped out and laid flat. Altitudes 5 to 6 inches.
Z-9661 .....(J—A—G) **27.50**

Algebraic Models



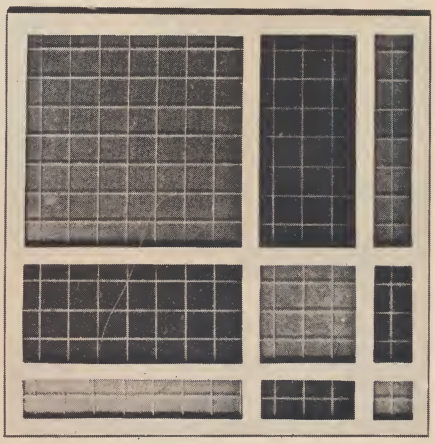
Z-9114

BINOMIAL CUBE — This beautiful plastic cube, with colored prisms inside, makes real, as the formula rarely does, the algebraic concept of the cube of a binomial — $(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$. Clear outer cube, eight removable prisms.
Z-9114 .....(A—G) **13.50**



Z-9139

BINOMIAL SQUARE — This two dimensional model shows clearly that $(a+b)^2 = a^2 + 2ab + b^2$. Colored plastic sections slide out for demonstration. To show to large groups, this model may be used with an overhead projector. 7½" square.
Z-9139 .....(A—G) **22.00**

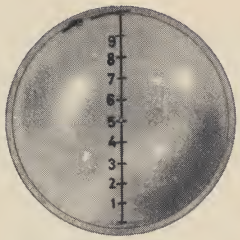


Z-9088

TRINOMIAL SQUARE — This model shows $(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2ac$. Colored sections can be removed for demonstrations. Model is opaque. Size 9" square.
Z-9088 .....(A—G) **22.00**

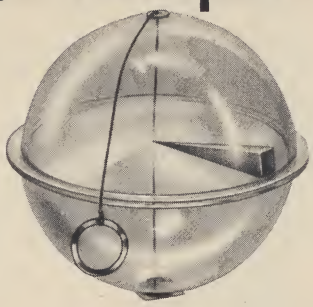
New versions of models Z-9139 and Z-9088 featuring transparent baseplates which make them suitable for use with your overhead projector are listed in this catalog with other projectable models.

Spheres of Transparent Plastic



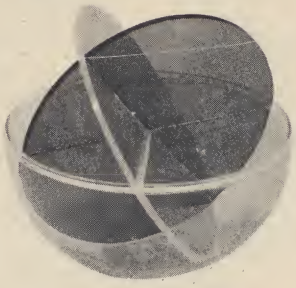
Z-9190

SPHERE — Simple, accurate model, useful at all grade levels. Diameter of equatorial plane calibrated 1-10. Diameter of sphere is 4 inches.
Z-9190 ..... **(L—U—J—A—G) 9.25**



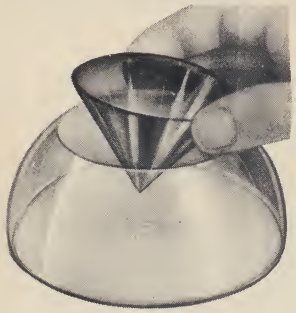
Z-9122

SPHERE WITH AXIS — Plastic section divides sphere into hemispheres. Axis is cord for suspension. Internal pyramid shows a central angle.
Z-9122 Dia. 5". ..... **(L—U—J—A—G) 8.75**

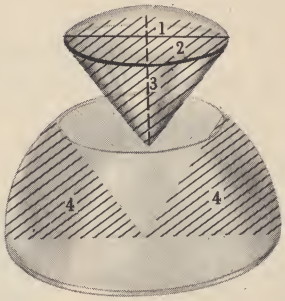


Z-9107

SPHERE WITH GREAT CIRCLE SECTIONS SHOWING EULER'S TRIANGLE — Cut away sphere has three fixed great circle sections showing triangles and lunes.
Z-9107 Dia. 5". ..... **(J—G—T) 10.00**



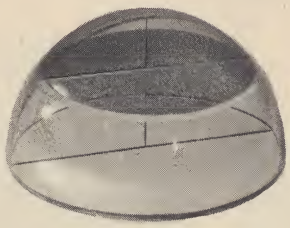
Z-9101



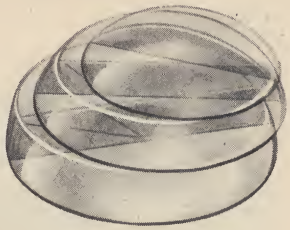
Z-9053

HEMISPHERE WITH SPHERICAL CONE — Removable spherical cone, colored.
Z-9101 Diameter 5 inches ..... **(J—G) 9.75**

HEMISPHERE WITH SPHERICAL CONE AND AXIAL SECTION — Colored axial section and removable spherical cone. Parts numbered as shown above.
Z-9053 Diameter 5 inches ..... **(J—G) 29.50**



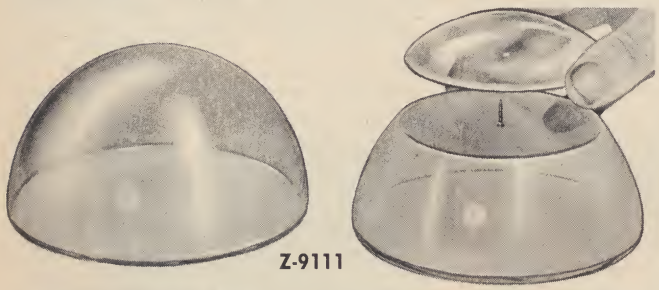
Z-9224



Z-9477

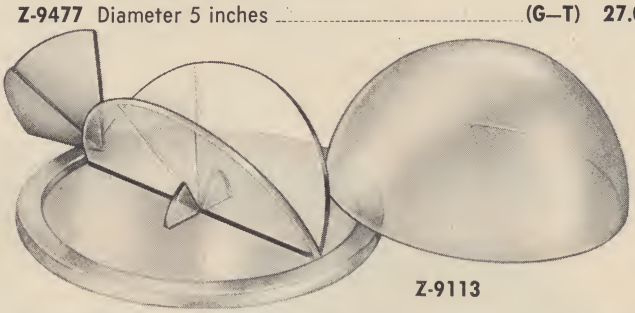
HEMISPHERE WITH AXIAL AND PARALLEL SECTIONS — Has axial section and section parallel to base. Sections not removable.
Z-9224 Diameter 5 inches ..... **(J—G) 14.00**

HEMISPHERE, DISSECTIBLE — Three segments formed by two planes parallel to base at ⅓ radius, with fixed colored axial section in each. Useful radii indicated.
Z-9477 Diameter 5 inches ..... **(G—T) 27.00**



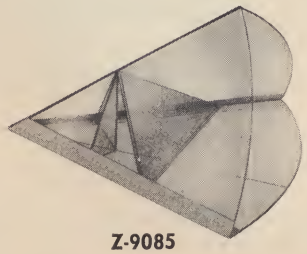
Z-9111

SPHERE WITH SEGMENTS — Separates into two hemispheres as shown; one further separates into a segment of two bases and a segment of one base.
Z-9111 Diameter 5 inches ..... **(J—G) 9.00**



Z-9113

HEMISPHERE WITH LUNE — Spherical triangle may be removed from the lune as shown. Lune and triangle are of contrasting colors. Hemisphere clear, base opaque.
Z-9113 Diameter 5 inches ..... **(J—G) 11.50**

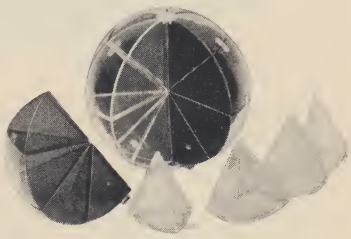


Z-9085

SPHERICAL TRIANGLE — Right spherical triangle which may be unfolded along radii, exposing fixed colored interior planes meeting at various angles. Very useful in spherical geometry and trigonometry.
Z-9085 Height 9 inches ..... **(G—T) 17.50**

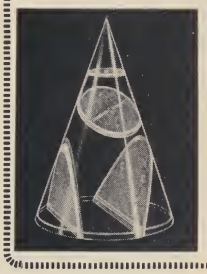
DISSECTIBLE SPHERE

Consists of 32 removable pyramids (16 are three-sided; 16 are four-sided): any four form a segment that is ⅛ of the sphere. Unique model demonstrates that a sphere consists of pyramids and is useful for understanding formula for volume of sphere (which is based on using volume formula of pyramids).
Z-9234 ..... **45.00**

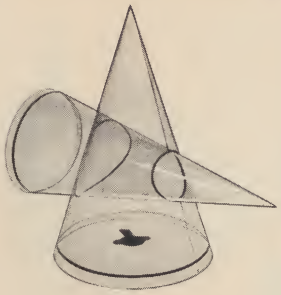


L-Lower elementary. U-Upper elementary. J-Junior high school. A-Algebra. G-Geometry. T-Trigonometry.

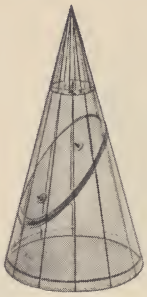
Cones and Conic Sections



DISSECTIBLE CONE — Here are five models assembled as one, carefully fitted to show the four conic sections: circle, ellipse, parabola, and hyperbola. Each face is colored so that sections stand out clearly. Large demonstration size. Height: 12".
Z-9048 ..... **52.50**
J-A-G



Z-9432



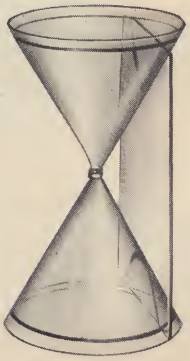
Z-9015

Z-9069

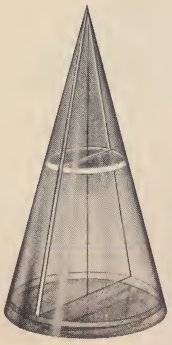
PENETRATION, CONE, CONE — Unmarked cones intersecting at right angles.
Z-9432 ..... Height: 8" **13.50**
G

DISSECTIBLE CONE WITH ELEMENTS — Right circular cone with horizontal and oblique sections. Lines on conical surface help students to understand the locus nature of cones. Pins in sections are perpendicular to plane of section. As in other models, base is recessed to avoid scratching when placed on rough surface.
Z-9015 ..... Height: 8" **18.50**
J-G

CYLINDER, ELLIPSE SECTION — Cylinder with elliptical section. This simple beautiful model has a non-removable section.
Z-9069 ..... Height: 8" **6.25**
J-A-G



Z-9126



Z-9083

Z-9128

Z-9140

DOUBLE CONE, HYPERBOLIC SECTION — Hyperbolic sections are formed by a plane cutting both nappes of the cone. Cone is of clear plastic and plane is colored.
Z-9126 ..... Height 10½" **10.00**
A-G

CONE, HORIZONTAL AND VERTICAL SECTIONS — Shows element, axis, section. Aids in introduction of lateral area, and volume formulas.
Z-9083 ..... Height 10½" **17.50**
J-G

CONE, WITH SECTIONS — This model shows the ellipse, parabola, and hyperbola. It is not dissectible. Each section of this beautiful model is brightly colored for emphasis. For display or demonstration.
Z-9128 ..... Height 10½" **10.00**
U-G-A-J

DISSECTIBLE WOOD CONE — Conic sections of circle, ellipse, parabola, and hyperbola are clearly shown. Easily assembled and disassembled, the cone is made of naturally finished contrasting hardwoods. Base diameter, 6", Height: 9".
Z-9140 ..... **20.00**

Z-9413

Z-9192

Z-9080

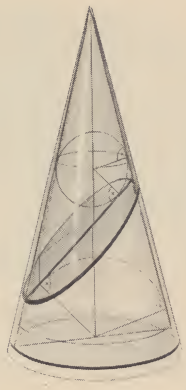
SINGLE SECTIONED CONE SET

This set of three cones consists of one each of the singly-sectioned cones shown at the left. They are excellent for display, student study, or demonstration. Height each model: 10½" Although they may be purchased individually, the pricing per set represents a helpful saving. The set contains:

Cone, Elliptical Section, Z-9413 ..... **7.50**
Cone, Hyperbolic Section, Z-9192 ..... **7.50**
Cone, Parabolic Section, Z-9080 ..... **7.75**

CONE SET (as described)
Z-9682 ..... (set) **21.50**
U-J-A-G

Cones and Conic Sections



Z-9019

Z-9071

Z-9081

CONE, PLANE ELLIPTICAL SECTION — Ellipse section, plus vertical section to show outline of spheres of contact.
Z-9019 Height: 10½" **19.00**
G

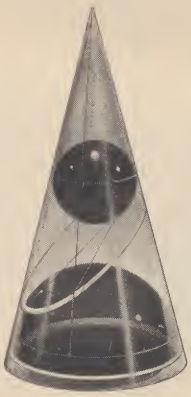
CONE, INTERNAL VIEW — Model showing ellipse and spheres of contact through a vertical section.
Z-9071 Height: 10½" **37.50**

CONE, PARABOLIC SECTION AND SPHERE — This model shows a parabolic section and a sphere which is tangent to the section plane and to the cone.
Z-9081 Height: 10½" **13.75**

CYLINDER WITH SPHERES — This model provides the basis for some original work on spheres and cylinders. Proof that section is an ellipse accompanies model. Altitude 7 inches, diameter 3 inches.
Z-9172 ..... **12.00**
G—T

DANDELIN'S PROBLEM

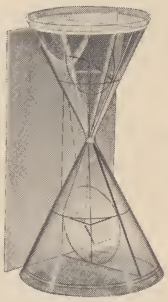
Place two spheres in a cone and pass a plane through the cone tangent to the spheres. The section will be an ellipse if the spheres are in the same nappe of the cone, a hyperbola if in different nappes, and a parabola if one sphere is an infinite distance from the vertex. This stimulating little problem is well within the reach of a high school solid geometry student; all he needs is a model such as our Z-9105, and the locus definitions of the conic sections. Perfect for enrichment, challenging as a regular assignment. A proof accompanies each model. Other problems of a trigonometric nature may be derived from these models.



DANDELIN'S CONE

CONE, ELLIPTICAL SECTION, SPHERES — A most beautiful model, showing the plane of the ellipse is tangent to both spheres. Distance between tangency points is indicated. Determination of this distance is a meaningful problem for advanced algebra and geometry students. Two spheres and tangent plane in color. Lines and circles plainly marked.
Z-9105 Height: 10½" **12.50**
A—G—T

Z-9072

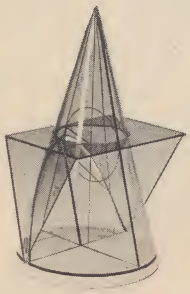


Z-9127

CONE, HYPERBOLIC SECTION AND SPHERES — Two spheres of contact are shown in this model, one in each nappe of the cone. Includes proof of this case of Dandelin's problem.
Z-9072 Height: 9½" **21.00**
G

CONE, PLANE HYPERBOLIC SECTION — Two vertical sections show the hyperbola and outline the spheres of contact. Includes proof that section is a hyperbola.
Z-9127 Height: 9½" **22.50**
G

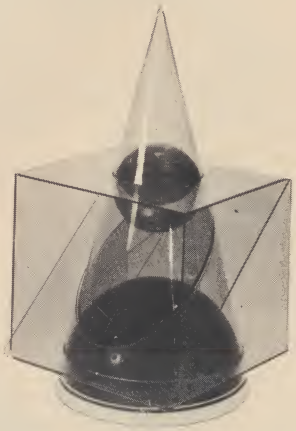
Z-9017



Z-9058

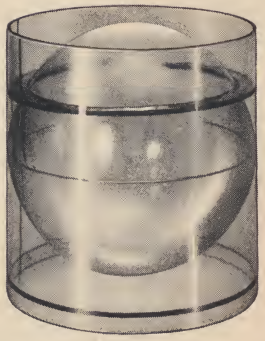
CYLINDER, PLANE SECTION — Shows vertical and diagonal sections of a cylinder. Arcs indicate inscribed hemispheres for study of Dandelin's problem. **G**
Z-9017 ..... **Height 6"** **18.00**

CONE, PARABOLIC SECTION, AUXILIARY PLANES — Cone with horizontal, vertical and parabolic sections. For study of the parabola. **A—G—T**
Z-9058 ..... Height 10½" **35.00**



CONE, ELLIPTICAL SECTION, AUXILIARY PLANES — Auxiliary planes removable. For analysis of spheres of contact problem. Proof furnished.
Z-9078 Height: 10½" .. **32.50**

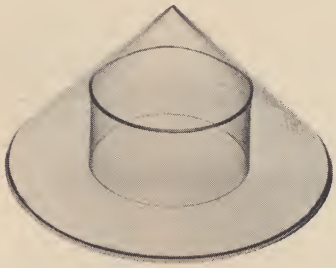
Cones and Cylinders



Z-9187

SPHERE IN CYLINDER — Sphere inscribed in cylinder. This model cannot be filled with liquid but it does illustrate the volume relationship of cylinder to sphere to be 3:2. Height of cylinder is approximately 5".

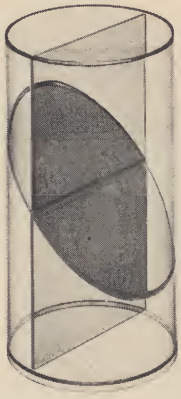
Z-9187 ..... **15.00**



Z-9731

CONE AND CYLINDER — Scale model used for volume of frustum, area of cross section, relation of volume to altitude for similar cones, and volume of the inscribed cylinder. Diameter of cone is 9½" (24 cm).

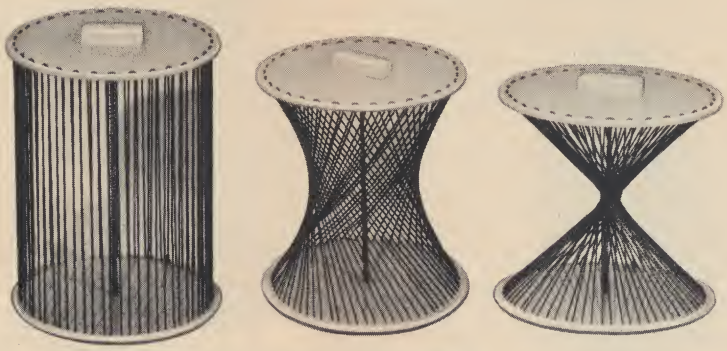
Z-9731 ..... **21.00**



Z-9733

CYLINDER WITH ELLIPTIC AND AXIAL SECTIONS — Cylinder is clear, sections are brightly colored. 8" high (20 cm).

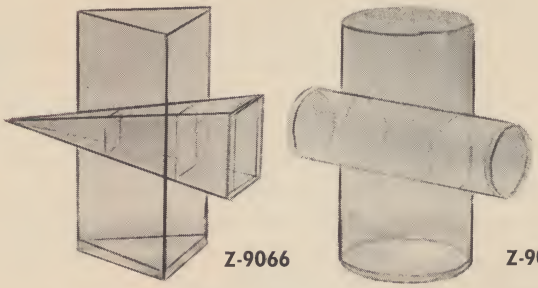
Z-9733 ..... **15.50**



Z-9198 (Three Views)

VARIABLE CYLINDER-CONE — This 8" high cylinder is constructed of two bases of plastic one of which slides on a central cone rod against the resistance of a spiral spring wound on the rod. The two bases are connected by cord threaded through each. When the top is twisted slightly, the cylinder shape is immediately distorted into a hyperboloid and finally into a cone of two nappes.

Z-9198 ..... **15.50**
J—A—G

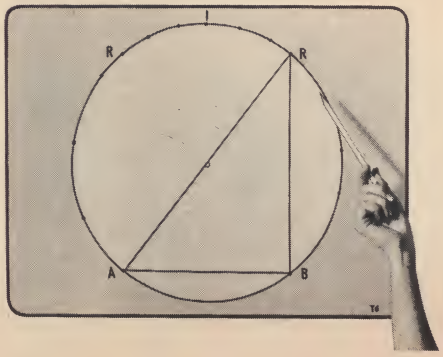


Z-9066 Z-9067

PENETRATION SET — Both models show the method of obtaining a curve of a common interpenetration, thus providing an introduction to techniques for determining points on curves of penetration. Z-9066 is a clear 3-sided prism penetrated at right angles by a transparent yellow 4-sided pyramid. Z-9067 is a clear cylinder penetrated at right angles by a transparent yellow cylinder.

Z-9066 ..... Prism **9.50**
Z-9067 ..... Cylinder **9.50**
Z-9667 ..... Per Set **16.50**

Burns Boards Provide Powerful Learning Stimulus



Z-8858

These boards are useful both for classroom demonstration and for student use in the learning of plane geometry. Each of ten boards deals with an important different element. All come complete with elastic cord and necessary pegs to create the figures.

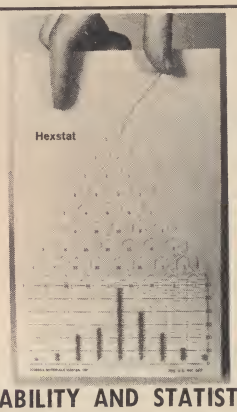
- Triangles and their Angles
- Quadrilaterals and Parallelograms and their Diagonals
- Polygons
- Pythagorean Theorem
- Altitudes of Triangles
- Circle Circumscribed about Triangle
- Triangles Equal in Area
- Angles Inscribed in Semi-Circle
- Medians of Triangles
- Perpendicular Bisector

TEACHERS' BOARDS — 18" x 24" models for classroom demonstration. Complete with elastic cord and pegs. Instructions include examples which can be set up quickly.

Z-8858 One each of 10 ..... Set **27.50**

STUDENTS' BOARDS — 9"x12" models for use by students working in pairs. Complete with elastic cord and pegs, instructions and work sheets.

Z-8856 One ea. of 10 subjects ..... Set **7.00**

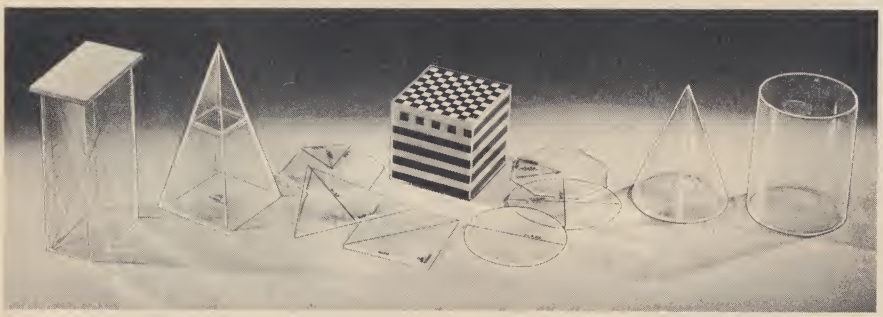


PROBABILITY AND STATISTICS LAB

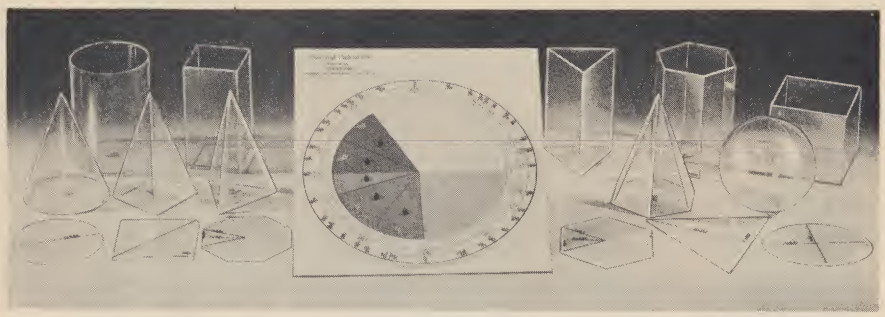
HEXSTAT DEMONSTRATION LAB UNIT. When the Hexstat is held upright, 300 small steel balls pour down through a network of hexagonal channels and are distributed into 9 parallel columns to varying heights, producing a bell-shaped distribution curve. Repeated readings quickly verify the results. Excellent for introducing mathematics of probability, ratio, etc. Includes 6 Hexstats and Teacher's Manual.

Z-8863 ..... Each **2.00**
Per dozen **18.00**

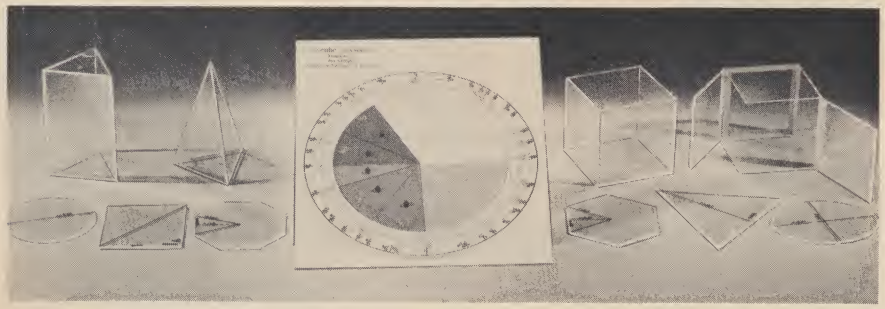
Math Study Sets



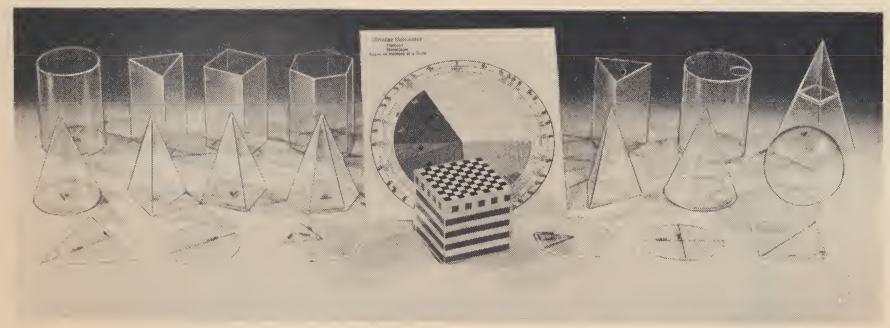
Z-9679



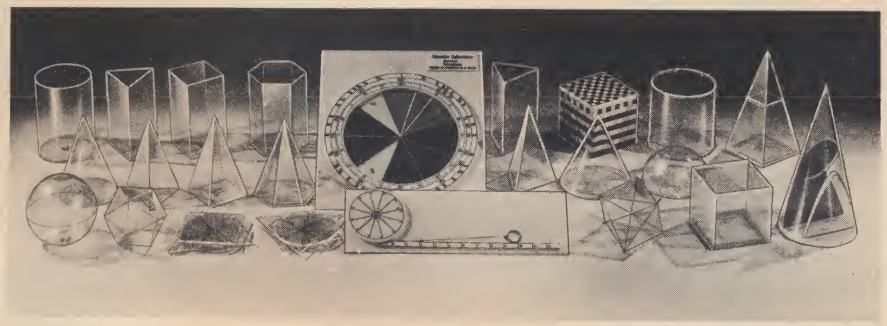
Z-9685



Z-9686



Z-9687



Z-9688

These helpful math study sets have been chosen by our mathematics education consultants from the hundreds of models listed in this book. Each set represents the recommended basic collection for a specific subject or grade level. Organized as sets, they provide a convenient and economical way in which teachers and administrators may supply their students with attractive and pertinent demonstrations.

Basic Elementary Sets

SET OF 11 MODELS— Z-9112 Liter Block, Dissectible; Z-9120 Cone and Cylinder Set; Z-9153 Plane Figures (6 models); Z-9173 Square Prism; Z-9439 Square Pyramid.

Z-9679 ..... **36.00**

SET OF 17 MODELS — Z-9063 Simple Solids Set (9 models); Z-9070 Cube; Z-9041 Fraction Disc; Z-9153 Plane Figures (6 models).

Z-9685 ..... **80.00**

Upper Elementary Sets

SET OF 10 MODELS— Z-9041 Fraction Discs; Z-9110 Cube with Layout; Z-9153 Plane Figures (6 models); Z-9183 Triangular Prism and Pyramid.

Z-9686 ..... **57.50**

SET OF 22 MODELS — Z-9063 Simple Solids Set (9 models); Z-9041 Fraction Discs; Z-9112 Liter Block, Dissectible; Z-9120 Cone and Cylinder Set; Z-9153 Plane Figures (6 models); Z-9183 Triangular Prism and Pyramid; Z-9191 Pyramid with Layout.

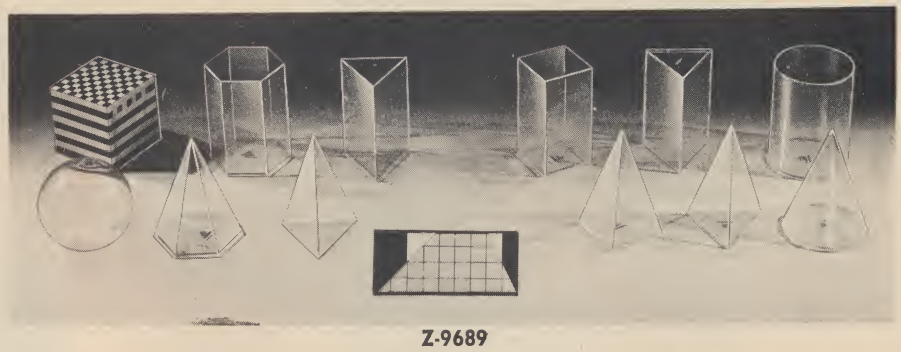
Z-9687 ..... **110.00**

SET OF 34 MODELS — Z-9041 Fraction Discs, Calculator; Z-9054 Icosahedron; Z-9055 Octahedron, Altitudes; Z-9063 Simple Solids Set (9 models); Z-9110 Cube with Layout; Z-9112 Liter Block, Dissectible; Z-9116 Cone, Sphere, Cylinder (large); Z-9128 Cone, with Sections; 2 sets Z-9153 Plane Figures (6 models); Z-9164 Measuring Disc for Determining "Pi"; Z-9183 Triangular Prism and Pyramid; Z-9191 Pyramid with Layout.

Z-9688 ..... **168.75**

Math Study Sets

These unique groupings represent a 10% saving for your school when prices are compared with their component models individually purchased. Educators consulting these pages will appreciate the convenience offered by these discriminating selections which are fully described in the pages of this catalog.

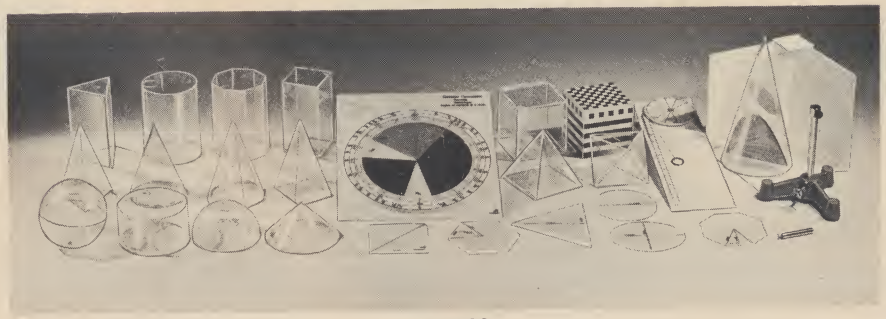


Z-9689

Junior High School Sets

SET OF 13 MODELS — Z-9063 Simple Solids Set (9 models); Z-9112 Liter Block, Dissectible; Z-9141 Trapezoid; Z-9183 Triangular Prism and Pyramid.

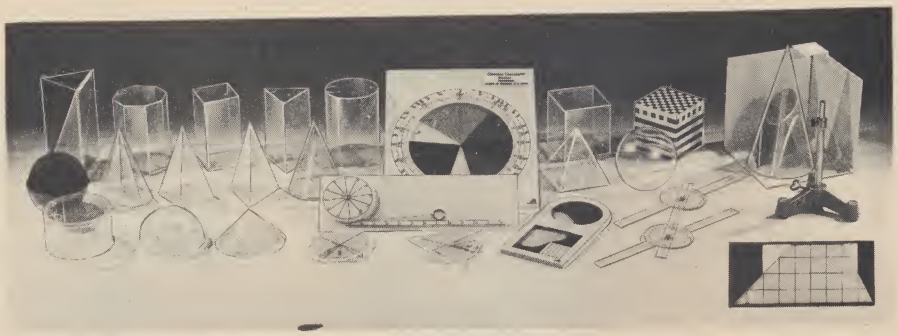
Z-9689 ..... **75.00**



Z-9690

SET OF 25 MODELS — Z-9041 Fraction Discs, Calculator; Z-9068 Octahedron; Z-9095 Volume Demonstration Set (14 models); Z-9112 Liter Block, Dissectible; Z-9128 Cone, with Sections; Z-9158 Plane Figures (6 models); Z-9164 Measuring Disc for Determining "Pi"; Z-9011 Display Stand.

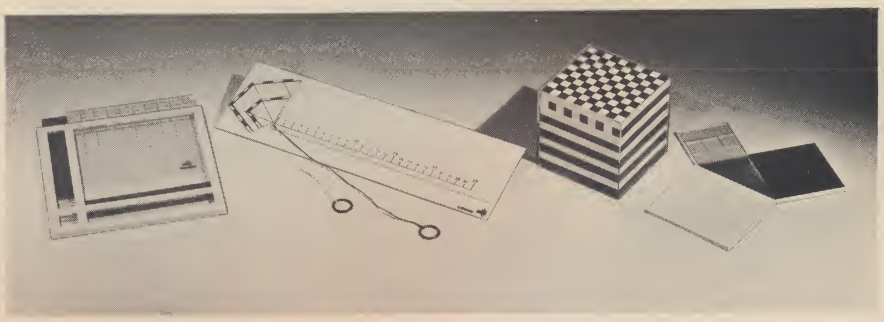
Z-9690 ..... **147.50**



Z-9691

SET OF 35 MODELS — Z-9041 Fraction Discs, Calculator; Z-9095 Volume Demonstration Set (14 models); Z-9100 Parallels and Transversal; Z-9107 Sphere, Great Circle Sections; Z-9112 Liter Block, Dissectible; Z-9128 Cone, with Sections; Z-9141 Trapezoid; 1 set Z-9153 Plane Figures (6 models); 1 set Z-9429 Plane Figures (6 models); Z-9164 Measuring Disc for Determining "Pi"; Z-9167 Circle Area; Z-9186 Trisectible Prism, Equilateral; Z-9011 Display Stand.

Z-9691 ..... **211.50**

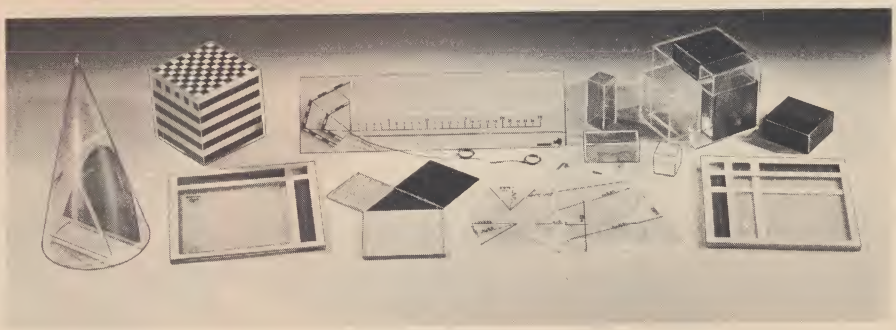


Z-9692

Algebra Sets

SET OF 4 MODELS — Z-9108 Pythagorean Theorem, 3-4-5 Demonstration Set; Z-9112 Liter Block, Dissectible; Z-9139 Binomial Square; Z-9154 Similar Polygons, Perimeter.

Z-9692 ..... **57.50**



Z-9693

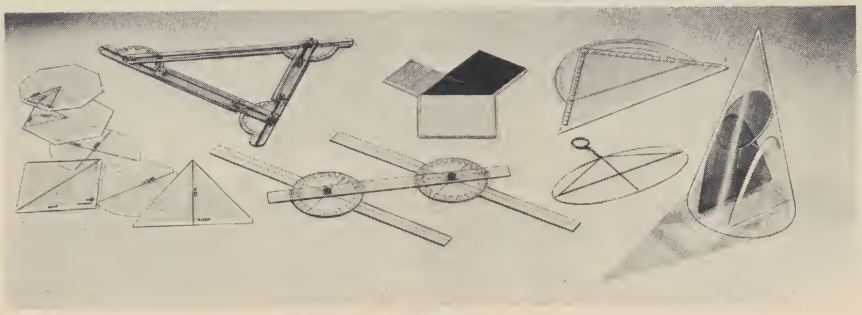
SET OF 13 MODELS — Z-9088 Trinomial Square; Z-9108 Pythagorean Theorem, 3-4-5 Demonstration Set; Z-9112 Liter Block, Dissectible; Z-9114 Binomial Cube; Z-9128 Cone, with Sections; Z-9139 Binomial Square; Z-9153 Plane Figures (6 models); Z-9154 Similar Polygons, Perimeter.

Z-9693 ..... **100.00**

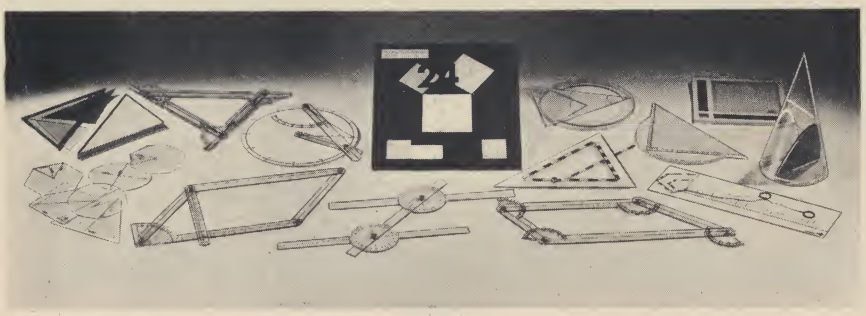
L-Lower elementary. U-Upper elementary. J-Junior high school. A-Algebra. G-Geometry. T-Trigonometry.

Math Study Sets

Stimulate interest in advanced mathematics by visual demonstrations. The groupings on this page are appropriate for secondary level subjects and essential for visualization of the more difficult concepts.

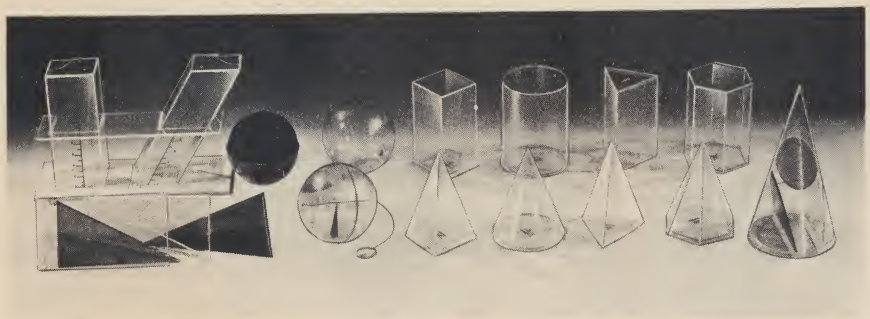


Z-9694



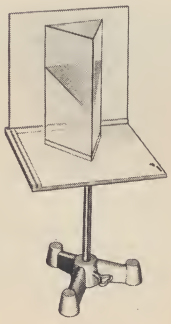
Z-9696

Z-9697



Z-9698

Z-9011



Z-9134

Plane Geometry Sets

SET OF 12 MODELS — Z-9100 Parallels and Transversal; Z-9106 Triangle; Z-9108 Pythagorean Theorem, 3-4-5 Demonstration Set; Z-9128 Cone with Sections; Z-9153 Plane Figures (6 models); Z-9159 Semi-Circle, Inscribed Angle; Z-9168 Ellipse, by String.
Z-9694 ..... **71.75**

SET OF 19 MODELS — Z-9100 Parallels and Transversal; Z-9102 Quadrilateral; Z-9104 Parallelogram with Altitude; Z-9106 Triangle; Z-9128 Cone, with Sections; Z-9139 Binomial Square; Z-9142 Pythagorean Theorem Demonstration Set General; Z-9145 Triangle, Transversal; Z-9149 Right Triangle, Ratio; Z-9153 Inscribed Angle; Z-9159 Semi-Circle, Inscribed Angle; Z-9163 Angle Measurement Device, Inscribed and Central Angles.
Z-9696 ..... **225.00**

Solid Geometry Sets

SET OF 11 MODELS — Z-9063 Simple Solids (9 models); Z-9181 Cavalieri's Theorem Demonstration Set, Square Bases; Z-9186 Trisectible Prism, Equilateral.
Z-9697 ..... **77.50**

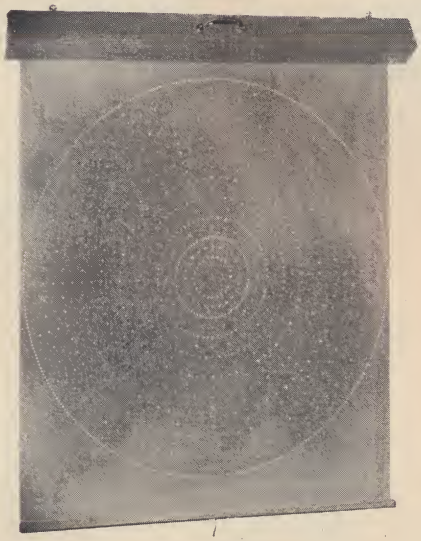
SET OF 14 MODELS — Z-9186 Trisectible Prism, Equilateral; Z-9107 Sphere, Great Circle Sections; Z-9122 Sphere with Axis; Z-9181 Cavalieri's Theorem Demonstration Set, Square Bases; Z-9128 Cone, with Sections; Z-9063 Simple Solids Set (9 models).
Z-9698 ..... **102.50**

DEMONSTRATION STAND — For better visibility of three dimensional models, displaying them approximately 10" above the table surface, against a clear white background. Consists of three planes with 8" edges, 10" rod, and tripod base whose rubber feet make a triangle 5½" on a side.
Z-9011 ..... **19.50**

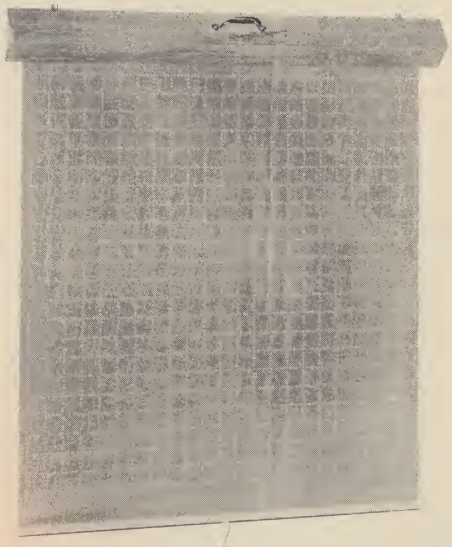
BACKDROP STAND, TWO PLANES—Similar to item Z-9011, except with one upright plane. Use with rod and tripod nos. Z-9064 and Z-9065. Each plane is 8" square.
Z-9134 ..... **12.00**

L-Lower elementary. U-Upper elementary. J-Junior high school. A-Algebra. G-Geometry. T-Trigonometry.

Graph Stencils, Charts, Stamps



PERFORATED GRAPH STENCILS



POLAR COORDINATE GRAPH STENCIL

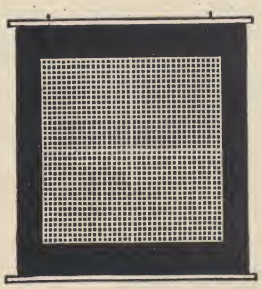
Chalk-filled eraser will transfer pattern to the blackboard. 10 unit circles 1¾" apart. Outer circle 35" diameter. Central angles are drawn at 15° and 5°. Spring roller.

Z-8883 ..... **22.50**

RECTANGULAR COORDINATE GRAPH STENCIL

Pattern transfers to the blackboard by a chalk-filled eraser. Consists of 1½" squares. Dots divide sides into 5 parts for decimals or fractions. With spring roller.

Z-8884 ..... **22.50**



Z-9034

GRAPH CHARTS

Z-8887

RECTANGULAR COORDINATES CHARTS

One-inch squares, 36 each way, with accentuated center lines, printed on cloth for use with chalk. 40x54 inches.

Z-9034 Wood rollers top and bottom, hangers **13.75**

Z-8885 Spring rollers, hangers **17.50**

POLAR COORDINATES CHART

40 inch diameter graph divided into 15° angles with 5° indicated. Printed on durable Texoprint, which shows chalk markings. 44x52 inches, metal rods and hangers.

Z-8887 ..... **15.75**

REVERSIBLE GRAPH CHARTS

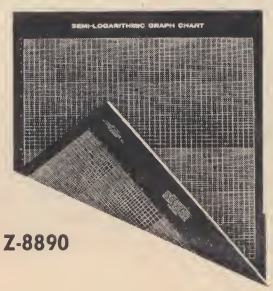
40x54 inch cloth with rectangular coordinates on one side and polar coordinates on the other. With plain rollers top and bottom.

Z-8888 ..... **16.50**

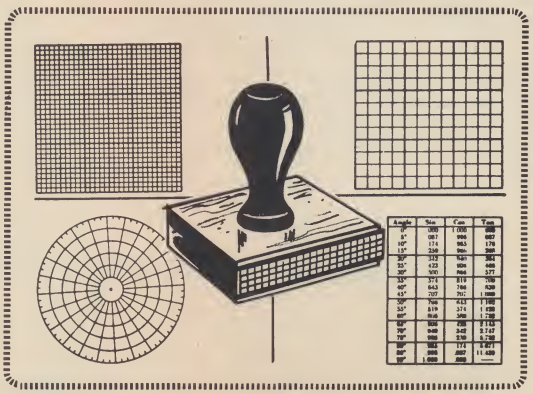
Z-8889 Same as Z-8888, but with spring rollers **22.50**

LOGARITHMIC CHART — 44x52". Reversible. Semi-log on one side, full log on the other. Durable Texoprint. Metal rod and hangers.

Z-8890 ..... **14.85**



Z-8890



GRAPH STAMPS

GRAPH STAMP SET — Ideal for the math teacher for it saves time and money while providing clear and definitive reproductions. Set consists of following parts, each of which may be purchased separately:

Rectangular Coordinate Stamp — 100 blocks per square inch.

Z-8875 ..... **3.00**

Rectangular Coordinate Stamp — 16 blocks per square inch.

Z-8876 ..... **3.00**

Polar Coordinate Stamp — Circle is graduated in major segments of 15° with subdivisions every 5°.

Z-8877 ..... **3.00**

Ink Pad — Large size stamp pad with metal case.

Z-8879 ..... **1.50**

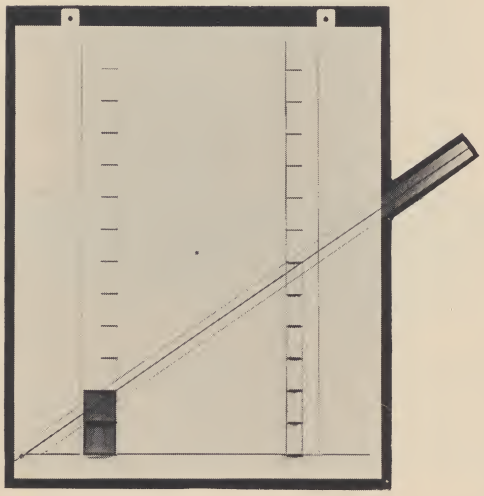
Z-8880 COMPLETE SET AS DETAILED ABOVE **10.00**

TRIGONOMETRIC FUNCTIONS STAMP — Contains sine, cosine and tangent. Functions for angles from 0-90° in 5° steps. 2½"x 3½".

Z-8878 (Not included in Z-8880) **3.50**

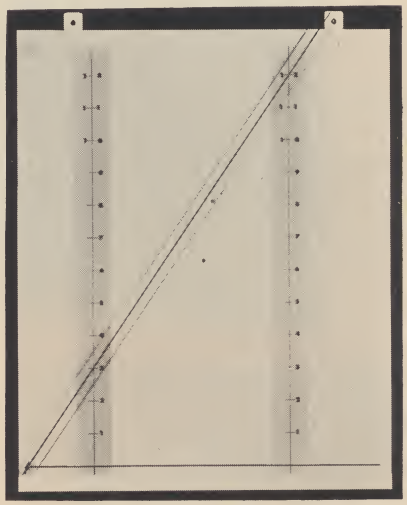
Demonstrators for Ratios and Fractions

PRESENTED ON 31½ x 40 INCH MARKABLE PLASTIC BOARDS



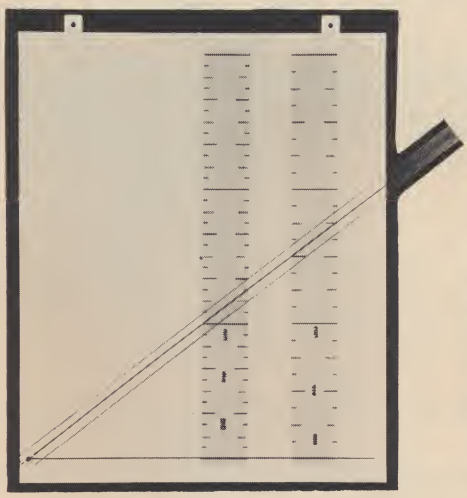
RATIOS PRESENTED WITH CONCRETE OBJECTS — Blocks and cylinders are stacked to show the ratio of two quantities. Blocks represent goods purchased, and cylinders their price. Piles are built accordingly, and receptacles are adjusted so that the indicator connects the tops of the two piles. The indicator may then be moved to show the cost of other quantities of goods, or the number obtainable for a given cost. Helps students to understand the general concept of ratio. Consists of board, 2 receptacles, set of blocks, set of cylinders, and indicator.

Z-9761 ..... **50.00**



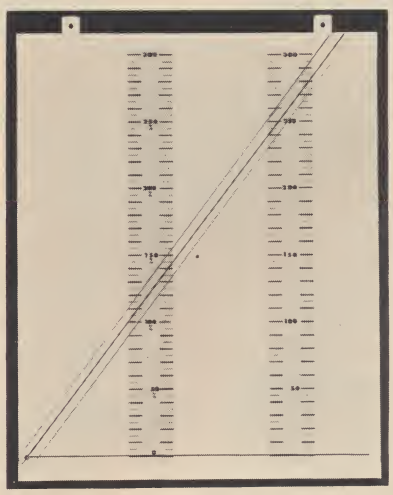
RATIOS OF WHOLE NUMBERS — Similar to No. Z-9761, but uses marked scales rather than concrete objects. Students are led to generalize the ratios; the continuity of the relationship is made evident. Partitive and ratio division may be shown clearly with these scales. For example, with the scales set as shown, divide 12 into 3 parts, or 12 into groups of 4. Consists of board, 2 scales with positive numbers, and indicator.

Z-9762 ..... **42.00**



RATIOS AND FRACTIONS — This set shows ratios involving fractions with the following denominators: 2, 3, 4, 6, 8, 9, 10, 12, 15, 18, 20, 28 and 30. As each scale runs up to 3 full units, a wide range of problems may be demonstrated. This teaching aid allows students to find answers to fraction problems before the formal algorithms for multiplication and division are introduced (true discovery teaching). Consists of board, set of 6 scales with fraction divisions, and indicator.

Z-9763 ..... **37.00**

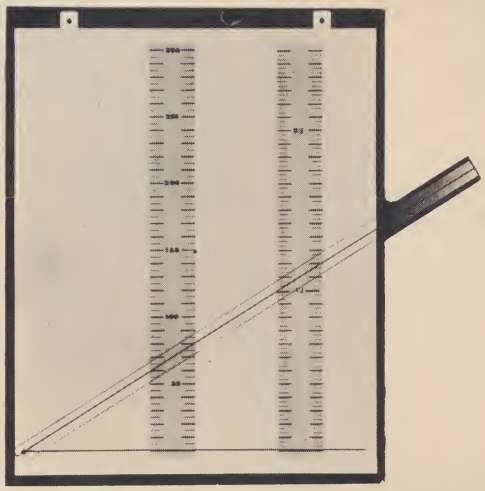


RATIO APPLIED TO PERCENTAGE PROBLEM — One scale shows rate, the other percentage and base. Scales may be used to solve for P, R or B. This work follows naturally from earlier studies of ratios, and leads easily to the $P = R \cdot B$ concept. Consists of board, rate scale, value scale, and indicator.

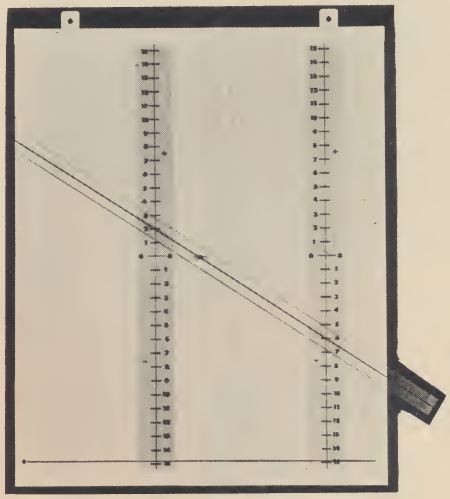
Z-9764 ..... **37.00**

Demonstrators for Ratios and Fractions

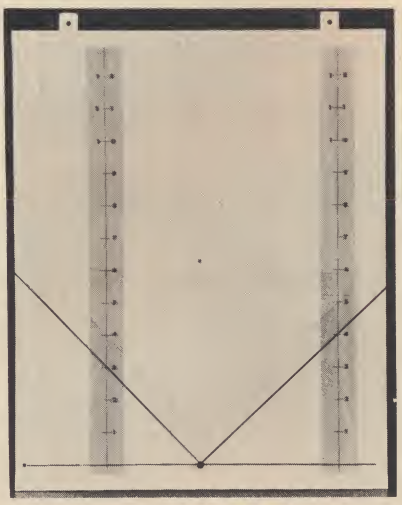
PRESENTED ON 31½ x 40 INCH MARKABLE PLASTIC BOARDS



RATIOS APPLIED TO INTEREST PROBLEMS — Computes interest for a given time period based upon the annual interest. The time scale covers 2½ years subdivided by months and by 10-day periods. The interest scale runs from 0 to 300 divided by 5's. Device may also be used for circle relationships based on central angles. Consists of board, value scale, time scale and indicator.
Z-9765 ..... **37.00**



RATIOS OF SIGNED NUMBERS — Useful in solving proportions involving negative numbers. For ratios containing both positive or both negative numbers the scales are placed on one side of the pivot; for one number positive and one negative the pivot separates the scales. The proportions may be chosen so that multiplication and division of positives and negatives are shown. Consists of board with two scales with signed numbers, and indicator with pivot in middle.
Z-9766 ..... **37.00**



INDIRECT VARIATION — The right-angled indicator pairs up numbers on the scales to illustrate the $xy = k$ relationship. For example, a 3 x 4 rectangle has the same area as a 2 x 6 or 1 x 12 rectangle. The scales are set as shown, then the indicator moved to touch 2 and 6 or 1 and 12. Other applications include the time required to perform a task when different numbers of workers are employed. Consists of board with two positive scales and right-angled indicator.
Z-9767 ..... **37.00**

FRACTION ADDITION AND SUBTRACTION SCALE — A versatile tool for making fractions real. Line segments representing fractions with many basic denominators may be drawn on this 6-in-1 scale. Mixed numbers are easy to depict. Addition is done by drawing segments end-to-end and then measuring to get the answer. Ideal for readiness activities leading to fraction algorithms. 5½ x 40 (1000 x 140 mm) inch plastic ruler has 6 permanently marked fraction scales.
Z-9768 ..... **12.00**

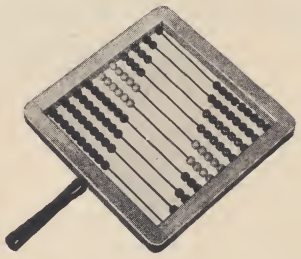
COMPLETE SET FOR RATIOS AND FRACTIONS — Contains all the parts used in the devices listed on the preceding page and on this page. By interchanging the various parts, you may perform all the functions of the individual devices at a considerable saving. Consists of 31½ x 40 inch markable plastic board, pair of block scales, pair of positive scales, fraction scale set, percentage scale, value scale, time scale, pair of signed number scales, indicators with pivot in center and pivot on the left, and angular indicator.
Z-9760 ..... **180.00**

Elementary Aids

JUMBO COUNTING FRAME

This demonstration abacus is a large and versatile classroom tens counting frame you may hang from the top of the chalkboard, from the chalk rail, or stand on the desk. Rigid steel frame holds 10 rods, each with 10 colorful beads. Frame measures 22" wide x 24" high.

Z-8855 ..... **14.50**



STUDENT COUNTING FRAME

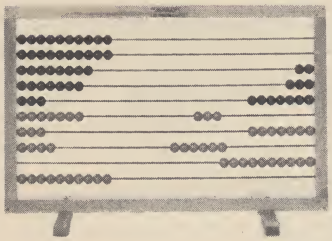
Student abacus has 10 rows, each wire with 10 colored beads. Sturdy frame approximately 8¾" square; with handle.

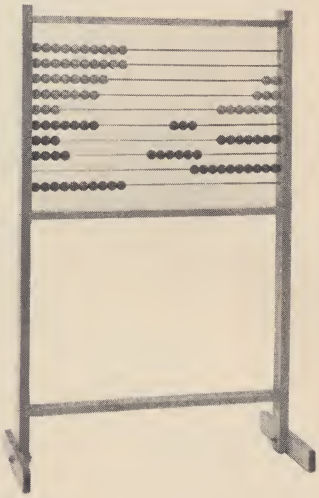
Z-8854 ..... Each **3.00**
Per Dozen **31.32**

ARITHME-STICKS

Excellent for learning simple counting, number facts in addition, subtraction, multiplication and division. Single stick is counter and number fact builder. Joined together, sticks make number panels, an abacus, per cent, and other manipulative aids. Box contains five sticks with 100 beads. Sticks approx. 8½" long. With teacher's guide.

Z-8852 ..... Per Set **5.00**

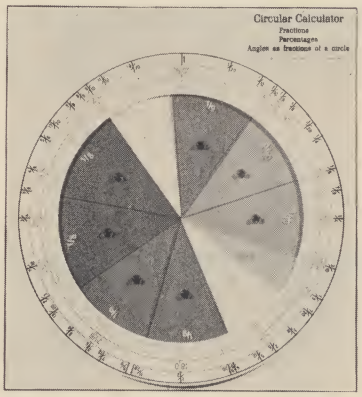




CLASSROOM COUNTING FRAMES

These versatile classroom counting frames assist effective math teaching of the important concepts of arithmetic, such as: facts of tens; numbers 1-10 and 11 to 100; addition and subtraction combinations and relationships; meaning of 2-figure numbers; bridging of tens; adding or subtracting 2-figure numbers with (or without) regrouping. Each unit has 10 removable push-spring rods with 10 colorful non-toxic beads on each wire. Frames are sturdily constructed of hardwood. Desk model measures 20" high x 32" wide. Floor model counting frame is 46" high x 26½" wide. A teaching manual is included with each frame.

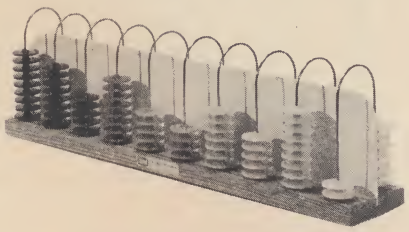
Z-8860 ..... Desk Model **12.25**
Z-8859 ..... Floor Model **19.50**



FRACTION DISC CALCULATOR

Here is a device to help you and your students picture fractional parts of a circle. Use the brilliantly colored wedges (sectors) or remove them and mark the white background plate with a grease pencil. 38 different common fractions are indicated. Percents (multiples of 5%) are marked as an aid in drawing circle graphs, in comparing common and decimal fractions, and in learning the meaning of percents. Several angles are calibrated in degrees. These help teach the concept of degree measure, and relate to common and decimal fraction parts of a circle. The wedges may be used on an overhead projector for various demonstrations. Outside diameter approximately 11".

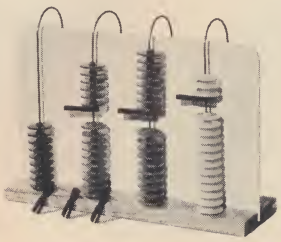
Z-9041 ..... **31.00**



PLACE VALUE BOARD

Easy-to-use device permits students to picture and to read bases below 10, binary number system, place value, numbers to billions and decimals to 4 places. Consists of 10 multicolored discs on each of 10 wires. Sturdy base 10" wide. With instruction manual.

Z-8857 ..... **6.00**



COMPUTING TYPE ABACUS

Consists of 4 wires with 20 discs on each except the thousands wire which has 9. Space dividers permit demonstrating the carrying step in addition and multiplication, and the regrouping step in subtraction. A decimal point insert is used for work with decimals. Base is approximately 13" wide. Comes with instruction manual.

Z-8853 ..... **5.00**

LaPine

GIVE TEACHING A NEW

dimension

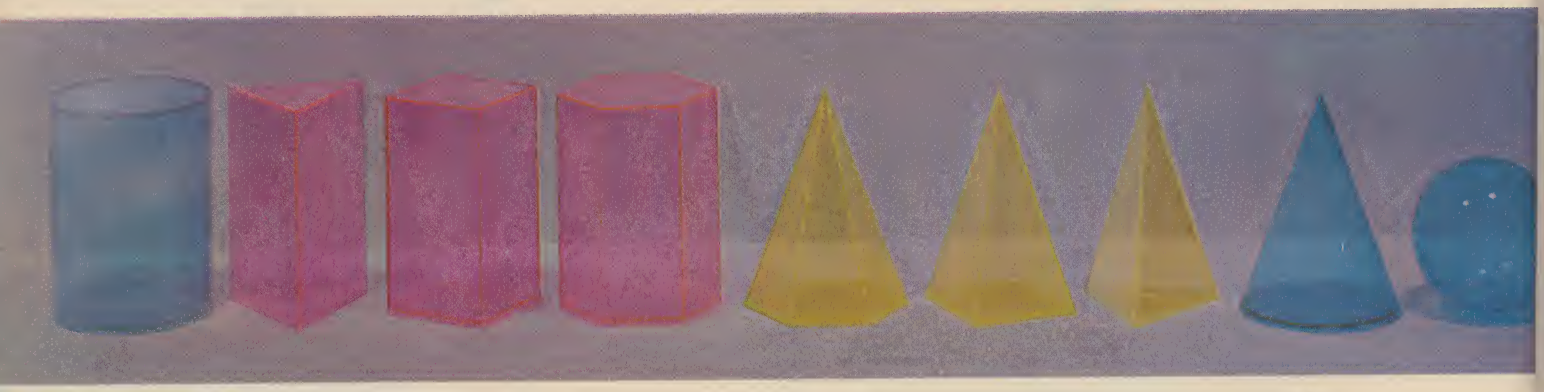
With colorful, accurate LaPine Mathematical Models

DISSECTIBLE SPHERE . . . This unique model consists of 32 removable pyramids (16 are 3-sided; 16 are 4-sided): any 4 form a segment that is 1/8 of the sphere. (See page 20.)
Z-9234 . . . . . **45.00**

DISSECTIBLE CONE . . . 5 models assembled precisely as one to show the 4 conic sections. This large model is 12" high. (See page 21.)
Z-9048 . . . . . **52.50**

DISSECTIBLE LITER BLOCK . . . A superb volume formula demonstration. (See page 12.)
Z-9112 . . . . . **8.00**

BINOMIAL CUBE . . . Clear outer cube with 8 removable colored prisms. (See page 19.)
Z-9114 . . . . . **13.50**



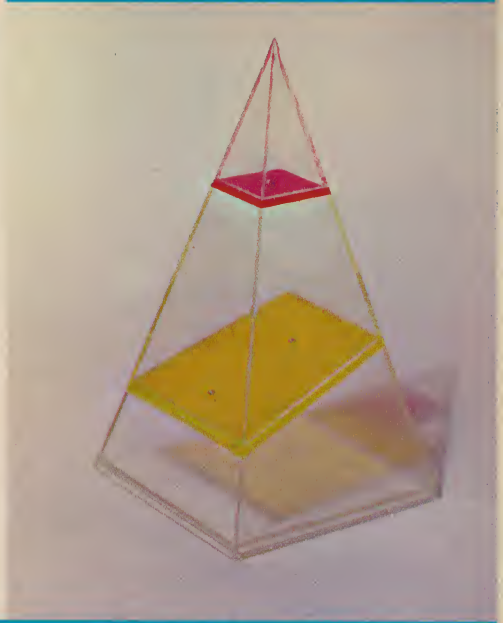
SIMPLE SOLIDS SET . . . 9 attractive basic models, each 6" high. (See page 13.) **Z-9063** **42.50**

CONE WITH SECTIONS . . . Shows ellipse, parabola and hyperbola. (See page 21.)
Z-9128 . . . . . **10.00**

SPHERE WITH GREAT CIRCLE SECTIONS . . .
Cutaway sphere shows Euler's Triangle. (See page 20.)
Z-9107 . . . . . **10.00**

DANDELIN'S CONE . . . Plane of ellipse is tangent to spheres. (See page 22.)
Z-9105 . . . . . **12.50**

CONE WITH PARABOLIC SECTION AND SPHERE (See page 22.)
Z-9081 . . . . . **13.75**

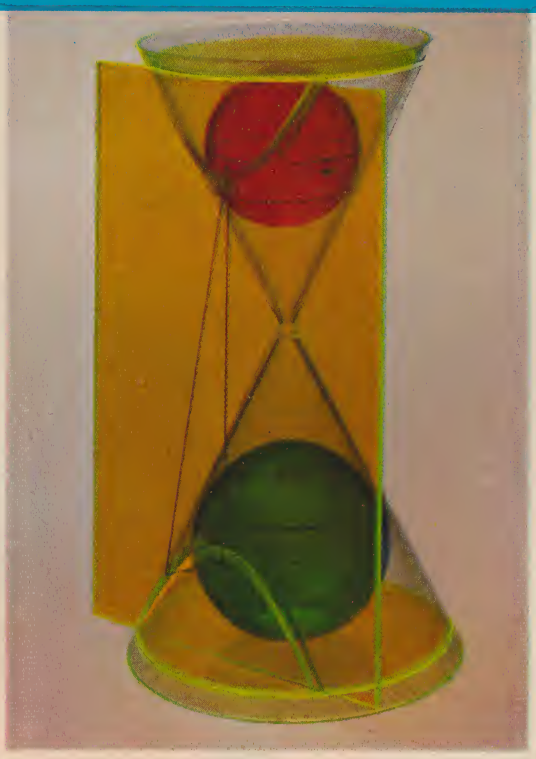


SQUARE RIGHT PYRAMID . . . With vivid colored sections. (See page 15.)
Z-9061 . . . . . **16.50**

Students Respond to these Colorful Mathematical Models

Each provides true "insight", creates real understanding of plane, solid and analytical geometry.

DOUBLE CONE WITH HYPERBOLIC SECTION (See page 21.)
Z-9126 . . . . . **10.00**



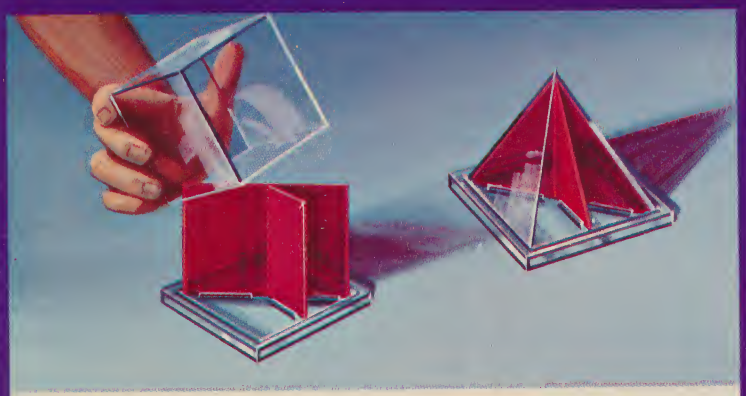
CONE WITH HYPERBOLIC SECTION AND SPHERES (See page 22.)
Z-9072 . . . . . **21.00**

TRISECTIBLE CUBE . . . With removable interior pyramids. (See page 10.)
Z-9188 . . . . . **12.00**

SAGE KIT®

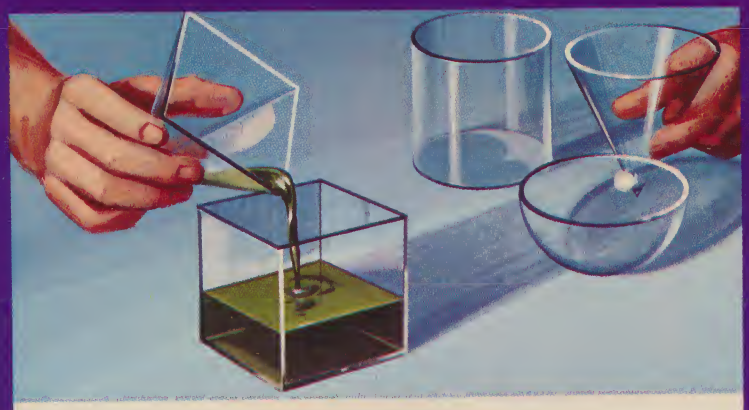
The Building Blocks Of Basic Geometry!

A puzzling geometrical relationship can become crystal clear with a Sage Kit model in the student's hand!

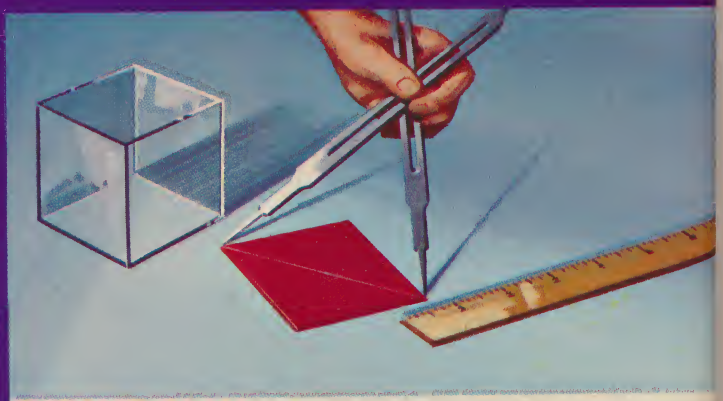


MODELS ASSEMBLE EASILY: The caps for the cube and the Square Pyramid may be used with the square base. All sections are accurately molded to fit the interiors of the geometric shapes precisely.

ILLUSTRATING PRINCIPLES OF SOLID GEOMETRY: The caps for Hemisphere, Cube, and Cone are designed for use with the circular base. A total of ten sections may be used for basic or advanced studies of these shapes.



VOLUME STUDY: The basic solids may be filled with liquid —students verify or discover standard volume formulas with Sage Kit. Student participation is the key to modern teaching practice and the big advantage of Sage Kit.



SECTIONS: Only Sage Kit has been designed for the study of sections of solids. Each part is readily accessible for examination and comparison. Sections may be removed or inserted for measuring or tracing.

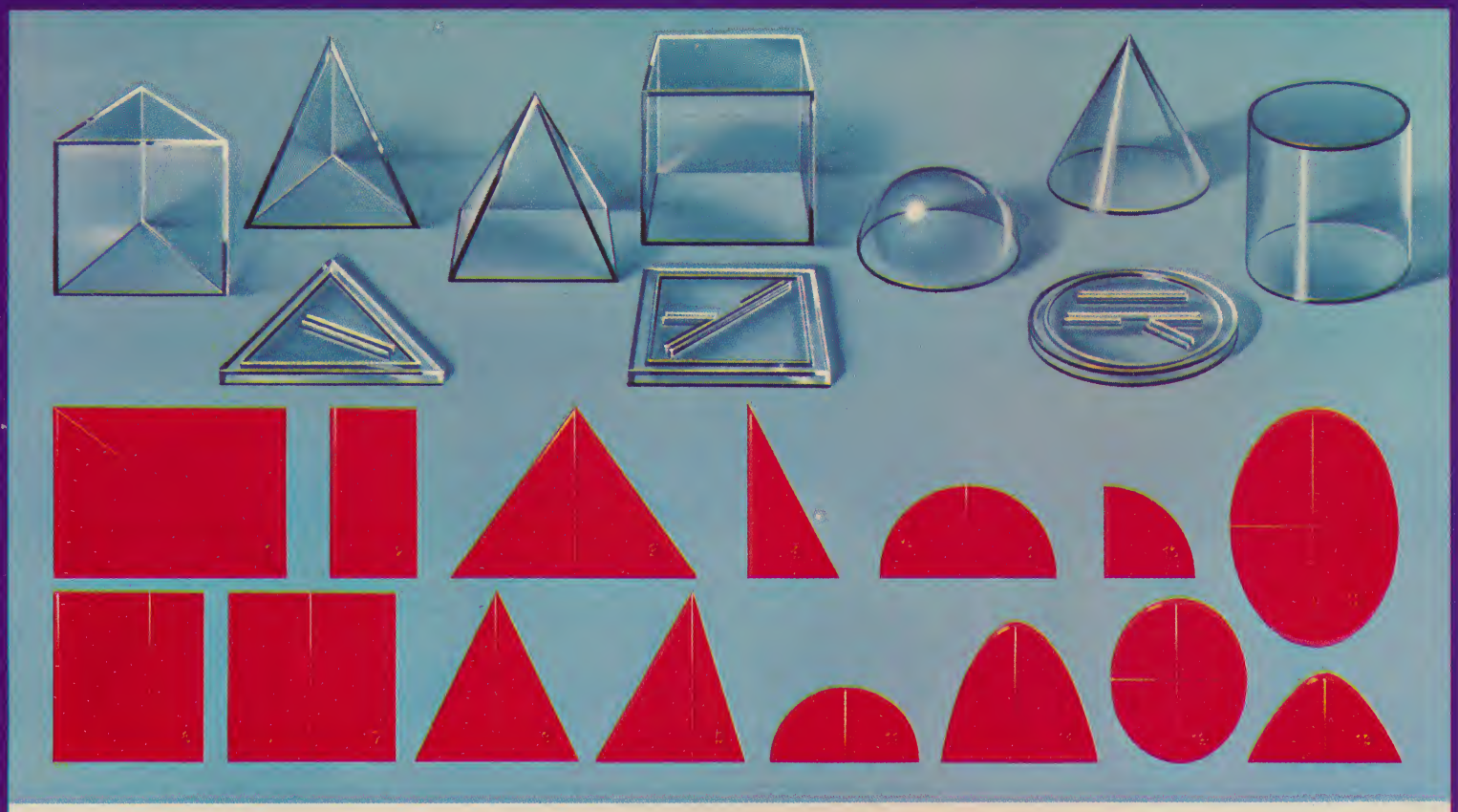
LaPINE SAGE KIT®

Student Applied Geometry Experiments

Reinforce your geometry lessons with student participation! Now—your students can assemble basic geometric solids with their principal sections in seconds . . . and Sage Kit components are mathematically correct in every detail. Versatile Sage Kit contains clear plastic pyramids, prisms, cones, cylinder and hemisphere . . . also three sturdy multi-purpose bases and 15 colored plastic sections. Sage Kit's unlimited applications focus attention on areas which may be unclear to the pupil, enabling understanding of the basic shapes and their important intersecting planes. All edges, diameters, and heights of 3-dimensional shapes measure 2½ inches. Colored sections can be shown beautifully on an overhead projector.

ATTRACTIVELY PACKAGED: Sage Kit shapes, bases and sections are stored in a specially designed compartmented storage case with fiberboard cover.

SAGE KIT ACTIVITIES: The 40-page manual included with the set has been prepared by Joseph W. Kennedy Ed. D., Associate Professor of Mathematics, Miami University, Oxford, Ohio. Your students will surely find this book a fascinating introduction to the world of geometry.



YOUR Z-5000 LaPINE SAGE KIT™ CONSISTS OF:

7 BASIC SHAPES—Cone, Cylinder, Hemisphere, Cube, Square Pyramid, Triangular Pyramid, Triangular Prism.

3 MULTI-PURPOSE BASES—Square, Triangular, Circular

15 SECTIONS—To form intersecting planes.

1 INSTRUCTION MANUAL—"SAGE KIT ACTIVITIES"

Z-5000. . . SAGE KIT, each **8.95**
Per Case of 12 . . . . . **95.00**

Economically priced so that each class may have several sets!

LaPINE SAGE KIT
only 8.95

®SAGE KIT is a trademark of LaPine Scientific Company

LaPine Magnetic

Number Line Program

Arithmetic teaching gains versatility, clarity and creativity with the LaPine Magnetic Number Line Program. Consists of: LaPine Magnetic Number Line Board — a green chalkboard with permanently printed number line; easy-to-read 2″ white magnetic numerals; magnetic 6′ white marking tapes, 2″ white identification discs; and a comprehensive Manual of Instruction with suggested uses for grades 1 through 9. Also available are individual 11″ student number line rulers. Approved NDEA Title III Purchase Guide No. 3042.

Any line can be a number line, but proper application of this helpful graphic device to its full potential requires a versatile set of tools . . . easy to use, yet educationally sound. The answer is the LaPine Magnetic Number Line Program.

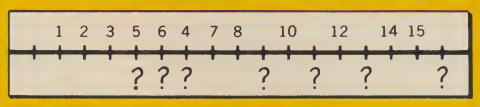
Build a new number line each day. LaPine's Magnetic Board can be any type of number line you wish to make it. Familiarity is established—students recognize the permanently screened line with its equi-distant markings. Yet, nothing else is shown until you are ready to teach it. From beginning lessons onward, student and teacher together rearrange their number line, placing discs or numerals in position, or revising their order. Drill and reinforce number sequence studies by removing or rearranging numerals. (With pre-printed number lines, review is less effective.) True flexibility.

Show the difference between printed and written numerals (4 and 4) and even write the word "four" on the LaPine board. Now choose a suitable drill. The board is quickly prepared for the next activity. Continue on to Addition or Subtraction, utilizing the marking tapes.

Individual help is best provided—when each student has a LaPine Number Line Ruler. Large, colorful pegs are easily manipulated by children, and fit firmly into the plastic ruler. Students solve problems in conjunction with the teacher's demonstration. Number and center lines are raised surfaces on the impact-resistant ruler.

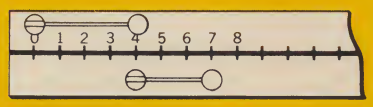
These diagrams demonstrate some of the many topics you teach easily with LaPine's Magnetic Number Line Board.

ELEMENTARY

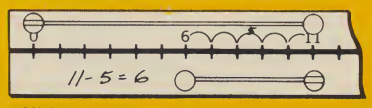


COUNTING

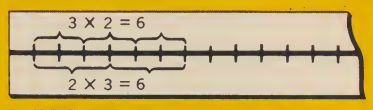
THE RULER



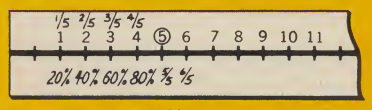
ADDITION



SUBTRACTION



MULTIPLYING-DIVIDING



FRACTION and %

ADVANCED

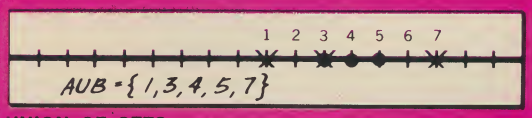
SETS
- Finite and infinite sets defined
- Subsets
- Union and Intersection

INVERSES AND OPERATIONS
- Opposites and Reciprocals
- Multiplicative inverses and the Number Line
- Elements in the set of integers

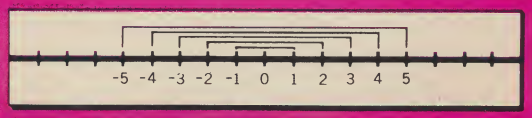
IRRATIONALS
- Location of rationals and irrationals
- Density

ABSOLUTE VALUE
- Greater than—
- Equality
- Less than—

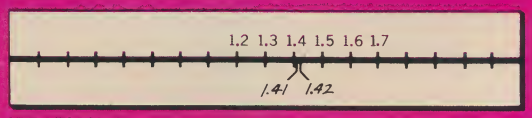
INEQUALITIES
- Absolute Value
- Simple open sentences
- Graphing



UNION OF SETS



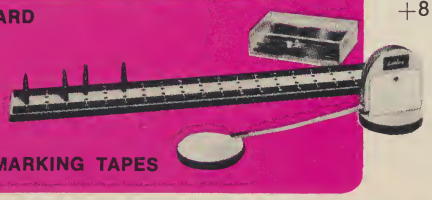
INVERSES AND OPERATIONS



IRRATIONALS

NUMBER LINE BOARD

STUDENT NUMBER LINE RULER



MAGNETIC BASE MARKING TAPES

HOW TO ORDER:

MAGNETIC NUMBER LINE DEMONSTRATION SET.
Consists of: Magnetic Number Line Board (use as a chalkboard, too!), with stainless steel frame and permanently screened number line; two metal marking tapes, white, with magnetic discs at both ends; set of 26 magnetic numerals and 8 minus signs, which permits listings of 0—16 or —8 to +8 on the number line board; set of 10 magnetic identification discs; one instruction manual.

Z-8981 . . . 41.50

SET OF STUDENT NUMBER LINE RULERS (10).
Each ruler blue and white, with 2 rows of numbers and holes; 19 red pegs and 19 blue pegs in a plastic box for peg storage. 1 Instruction Manual.

Z-8982 . . . 17.50

CLASSROOM NUMBER LINE SET.
Consists of: One Z-8981 set and two sets of Z-8982.

Z-8983 . . . 72.50

EXTRA SETS OF MAGNETIC NUMERALS.
Each set: 26 numerals and 8 minus signs for listings of 0—16 or —8 to +8 on the number line board.

Z-8991 . . . 8.75

Elementary Math Teaching Aids

Direct Reading Ball Abacus

This unique abacus adds, subtracts, multiplies, and divides up to 99,999, updating the age-old finger-computer principle with its direct reading feature. Free moving ball counters colored red, yellow, blue, black and white associate with highly visible numerals for simplified reading and understanding. Two models are available: one for student use, the other for teacher demonstration. Each comes with an excellent instruction manual prepared by Dr. Lola May.

STUDENT BALL ABACUS

Lightweight, high-impact case 5"x8" with large marble counters (as described above) easily manipulated by students. With instruction manual.

Z-8830 ..... Each **2.50**
Per Dozen **27.00**

ELEMENTARY MATHEMATICS FILMSTRIP SET

This instructive set of 6 color filmstrips contains the 138 color charts from the outstanding reference book "Mathematics Background For The Primary Teachers," by Ella L. Merton and Lola J. May. The topics covered by each filmstrip, as detailed below, indicate their correlation to the eighteen-chapter book.

Filmstrip 1: What to Expect in Elementary Math; Sets.
Filmstrip 2: Number and Numeral; Equalities and Inequalities; Number Sequence; Inverse Operations; Number.
Filmstrip 3: Commutative Properties; Associative Properties; Distributive Property of Multiplication over Addition; Identity Properties; Zero Property of Multiplication.
Filmstrip 4: Number Lines; Story Problems.
Filmstrip 5: Expanded Notation; New Format for Division.
Filmstrip 6: Geometry; Patterns.

Z-8776 Per Set with Book **20.00**

See the wide selection of filmstrips and overhead projectuals for teaching elementary mathematics offered in this catalog!

Z-8869
Z-8762

Z-9036
Z-8763

Z-8865
Z-8761

SLATED SPHERES

Draw and write with chalk on the dark green slate surface of these spheres. Indispensable for solid geometry, trigonometry, or higher mathematics. Nos. Z-8869 and Z-8862 have movable meridians and are on table stands. All other models are without meridians.

Z-8869	12" diameter	**31.75**
Z-8762	16" diameter	**56.50**
Z-9036	12" diameter	**28.50**
Z-8763	16" diameter	**51.50**
Z-8865	12" diameter	**25.00**
Z-8761	16" diameter	**43.50**

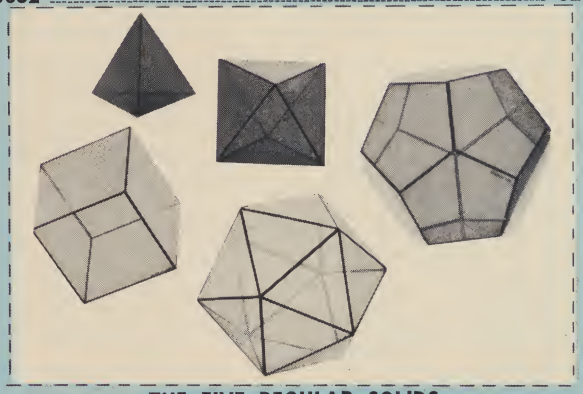
DEMONSTRATION BALL ABACUS

Large 17"x27" size for chalkboard. Constructed of lightweight, high-impact plastic. With instruction manual.

Z-8831 ..... Each **20.00**

CLASSROOM SET—30 STUDENT ABACI PLUS 1 TEACHER ABACUS

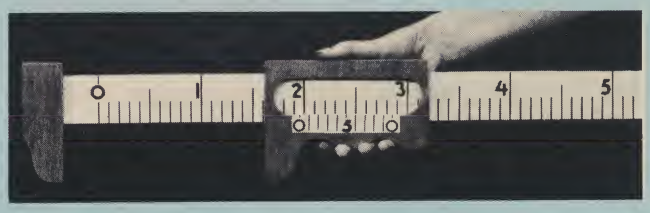
Z-8832 ..... **82.00**



THE FIVE REGULAR SOLIDS

Assemble (pre-cut) models of five solids, each in a different transparent color. The Tetrahedron, Hexahedron (cube), Octahedron and Icosahedron are all 2.7 inches on an edge. The Dodecahedron is 1.8 inches on an edge. All solids assemble in minutes into permanent plastic models. Use handy tabs provided to seal scored edges as you fold the pattern. Complete with instruction booklet.

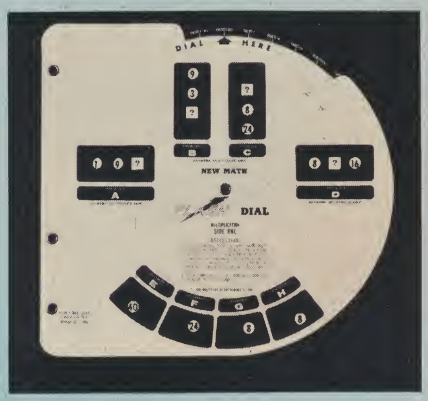
Z-8899 ..... **5.95**



DEMONSTRATION VERNIER CALIPER

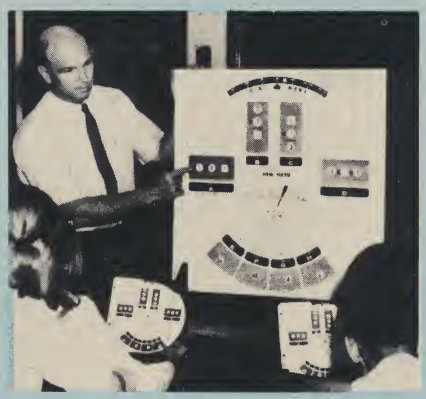
A large (28¾" long) yet lightweight caliper designed to aid in teaching the principle of the vernier scale. Large, clearly printed figures and graduations are clearly seen by the entire class. The main scale represents 6 centimeters, subdivided into 60 millimeters. The vernier scale is divided into 10 parts, and is equal in length to 9 "millimeters" of the main scale. The caliper is made of kiln-dried wood, with black lines and numerals on a white background. Scales align easily and are easily cleaned with a damp cloth. 28¾" long caliper comes complete with instructions.

Z-8848 ..... **9.50**



NEW MATH FLASH DIALS

These new materials have been developed for instruction in the concepts and structures of multiplication and addition (and their inverse operations). Each dial has 320 problems with answers. The problem is dialed on one side, the answer appears on the reverse side. Student dials for addition or multiplication are of sturdy cardboard, have reinforced holes for ring binders and are 8½" diameter. Teacher flash dials for addition or multiplication are aluminum, 28" diameter. Classroom sets (consisting of 30 student dials and one teacher dial) afford a saving of $12.



Student Flash Dials

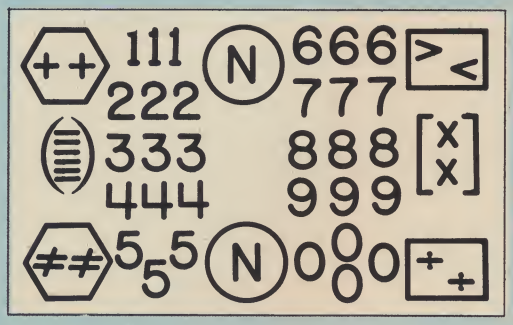
Z-8993	(Addition)	Each	1.50
	Per Set of 30		39.00
Z-8994	(Multiplication)	Each	1.50
	Per Set of 30		39.00

Teacher Demonstration Flash Dials

Z-8995	(Addition)	Each	36.00
Z-8996	(Multiplication)	Each	36.00

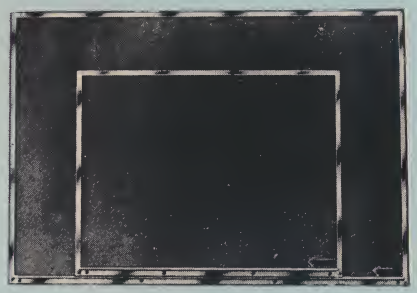
Classroom Sets—30 Student Dials plus 1 Teacher Dial

Z-8997	(Addition)	69.00
Z-8998	(Multiplication)	69.00



NEW MATH MAGNETIC SYMBOLS AND NUMBERS — Symbols for "Frame Arithmetic." Approved for use with "Modern Math Text" by Lola J. May. Large easily recognized symbols are molded of yellow break-resistant plastic. Numerals are 1½" high and $\frac{5}{32}$" thick. Frames hold 2 numerals. Set consists of 59 pieces and instructions.

Z-8804 ..... Per Set 5.50

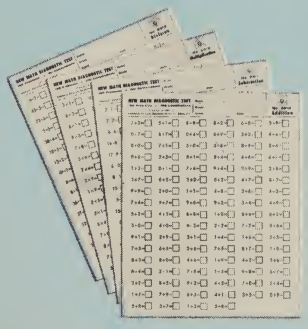


MAGNETIC CHALKBOARD (Steel) — Display Board for magnetic numeral displays or can be used as a chalkboard or bulletin board. Four small magnets come with each board to hold most any item in place. Writing surface is heavy-duty green Durasteel, laminated to ¼" thick hardboard. Frame and full-length trough for chalk is aluminum.

Z-0732	18"x24"	7.50
Z-0733	24"x36"	12.50

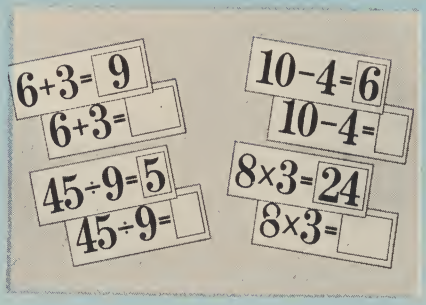
NEW MATH SELF TESTING CARDS—These cards allow students to learn the arithmetic combinations, test themselves and check their answers. Students learn combinations on side showing problem and answer. For self-testing, card is reversed and placed on a sheet of paper. Students then write answers through the cut-out section. Answers are checked by reversing the card again to side where problems and answers are given. Each set contains one dozen cards.

Z-8676	Addition	3.60
Z-8677	Subtraction	3.60
Z-8678	Multiplication	3.60
Z-8679	Division	3.60



DIAGNOSTIC TEST PAD SET—These tests may be used with flash cards. They provide a quick and sure way for teachers or parents to determine a child's grasp of fundamental concepts in the New Math program. Basic combinations in addition, subtraction, multiplication, and division are presented. Pads contain 50 sheets, each with 100 problems. Set of pads includes one each for Addition, Subtraction, Multiplication, and Division problems.

Z-8675 ..... 4.00



NEW MATH FLASH CARDS—Addition, subtraction, multiplication, and division combinations in New Math formulation. Students can learn the combinations, test themselves and check their answers. Presented in horizontal equations with boxed answers. Numbers and symbols are printed in dark green on durable white cards. Cards are 9"x3".

Z-8670	Addition (Set of 100)	1.40
Z-8671	Subtraction (Set of 100)	1.40
Z-8672	Multiplication (Set of 100)	1.40
Z-8673	Division (Set of 90)	1.40

FLASH CARD SET — Set contains all cards (390) as supplied for Nos. Z-8670, Z-8671, Z-8672, and Z-8673.

Z-8674 ..... 5.20

LaPINE/LOGIC TRAINER

• CLARIFIES "AND", "OR", "NOT" OPERATIONS • TRUTH TABLES IN SECONDS • VARIABLES AUTOMATICALLY FOLLOW SEQUENCE OF BINARY NUMBERS • FOR CLASSROOM DEMONSTRATION OR GROUP ACTIVITY

The LaPine Logic Trainer (LLT™), using integrated circuits (the most sophisticated circuitry in electronics), enables quick clarification of the basic postulates, theorems and laws of logic and set theory. **LLT** shows students a new dimension for the usually tedious explanations of "And", "Or" and "Not" operations.

With **LLT** you can effectively demonstrate Boolean Algebra, Switching Circuits and the following laws and theorems: Law of Absorption, Law of Complementarity, Law of Double Negation, Law of Identity, Associative Law, Commutative Law, DeMorgan's Law, Distributive Law, Idempotent Law.

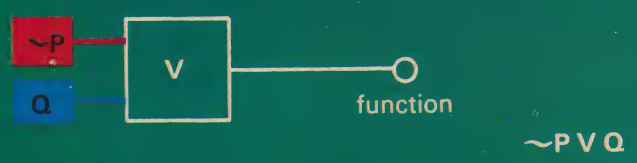
Truth tables for any function can be obtained in seconds. Simplification of functions can be checked in a fraction of the time it takes to do it at the chalkboard. "Experiments in Logic", the new manual for use with the LaPine Logic Trainer, guides the student through such challenging problems as—The Light on the Stairs, The Voting Machine, The Binary Adder.

The front panel, made of vinyl to enable instructor or student to write on it, contains four **"And"** gates, four **"Or"** gates, four **"Not"** circuits, an **"Implication"** network and an **"Equivalence"** network. Both inputs and outputs are equipped with jacks. The four variables P, Q, R, S, are shown each on a different colored area, with a light indicating its value (one or zero). Each variable has four jacks connected to its direct value (Shown, for example, as "P"), and 4 jacks connected to its inverse value (Shown, for example, as "~P"). This inversion of the variables simplifies the presentation of complicated functions.

Prior to each use of the LaPine Logic Trainer, the specific problem must be represented by connecting each of the variables used in the problem with the inputs of the appropriate function. The outputs of the functions may be further combined until the complete expression of the problem may be connected to the "Function" input for investigating its value using all combinations for the values of the variables.

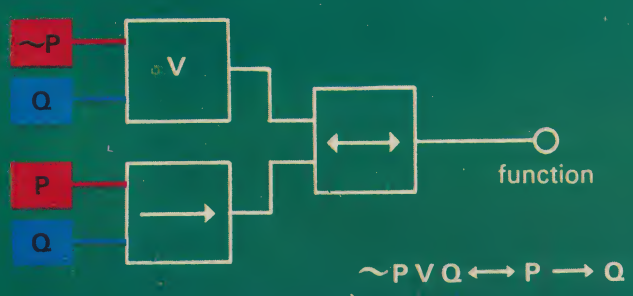
LLT features a hand-held control unit with a push-button for advancing from one combination of variables to the next (starting with 0000 and ending the sequence with 1111). This sequence represents the numbers 0 through 15 in a binary system, thus eliminating the possibility of missing a particular combination of variables. There is also a "Reset" button, which sets all the variables to the "0" (False) state.

LOGIC PRINCIPLES QUICKLY AND EFFECTIVELY SHOWN

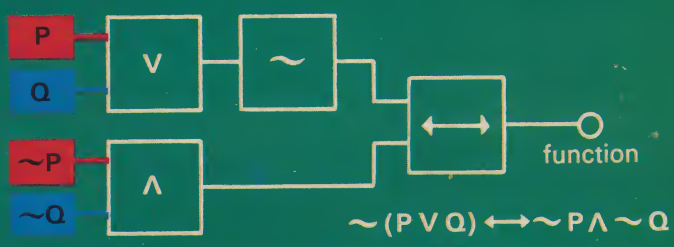


~P V Q

Evaluation of the function ~P V Q by a quick check of all the possible combinations of P and Q. It can easily be proved that the function ~P V Q is equivalent to the implication P→Q by an extension of this circuit into the following diagram:

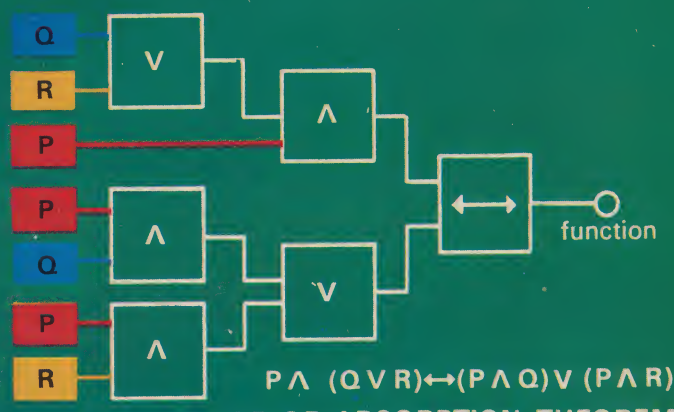


~P V Q ⟷ P → Q



~(P V Q) ⟷ ~P ∧ ~Q

PROOF OF DE MORGAN'S LAW



P ∧ (Q V R) ⟷ (P ∧ Q) V (P ∧ R)

PROOF OF ABSORPTION THEOREM

LaPINE LOGIC TRAINER (LLT™) • PORTABLE • SELF CONTAINED BATTERY OPERATED • PUSH-BUTTON CONTROLLED

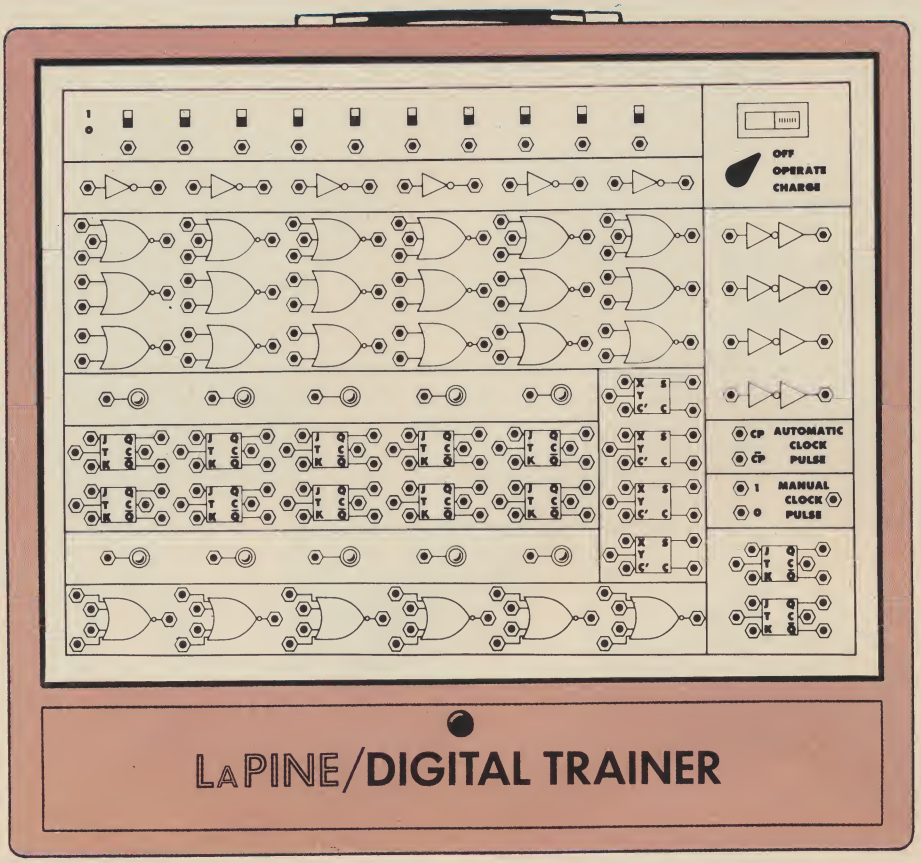
LLT's DESIGN FEATURES

Sturdy Plastic Housing—With carrying handle and wall hangers. Unit may be suspended from chalkboard chart rail.
Storage Compartment—For control unit, AC cord, 45 programming leads, instruction manual.
Vinyl Front Panel—Washable; instructor or students may make notations while working at the unit.
Meter—Indicates when batteries require recharging.
Battery Charger—Operates when unit is connected to an AC outlet, eliminating need for a special recharging cycle.
Electrical Requirements—115 Volt AC. **Case Dimensions**—26½" H x 27" W x 3" D. **Weight**—15 lbs.

Z-8000 LaPine Logic Trainer (LLT™)—Complete with Control Unit; 3 Nickel-Cadmium Batteries; Battery Charger Unit; 45 color-coded Programming Leads (9 each of black, red, yellow, green and blue); with connecting cord for 115 Volt AC, and Instruction Manual.

LaPINE LOGIC TRAINER (LLT™) 285.00

LaPINE/DIGITAL TRAINER



FEATURES

Housing—Sturdy beige plastic; with carrying handle and wall hangers. Unit may be suspended from chalkboard chart rail.

Storage — Compartment for programming leads, cord, and instruction manual.

Front Panel—Washable vinyl, easily cleaned.

Power Source—Unit operates from a set of nickel-cadmium batteries.

Meter — Indicates when batteries need recharging.

Charging—Either continuously during operation of LDT or during special charge cycle. Charger operates on 115 volts, AC.

The LaPine Digital Trainer (LDT™) demonstrates and clarifies digital operations for classroom instruction or math laboratory. Incorporates the latest advances in computer technology; uses integrated circuits. Furnished with complete instructions and a manual which describes in detail experiments to illustrate the following: Basic Logic Gates—AND / OR / NOR / NAND / INVERTER; Flip-flops; Boolean Algebra Functions; Binary Counters; Binary-Decimal Converter; Decimal-Binary Converter; Shift Register; Accumulator; Serial Addition/Subtraction; Parallel Addition/Subtraction; Gray to Binary Code Converter; Binary Coded Decimal Operations; Comparators—Equality/Relative Magnitude (plus many others).

Control is by automatic clock or manual clock pulsing. All inputs and outputs are equipped with jacks. All elements are designated by their logic symbols, and their jacks are arranged conveniently nearby. Notations for connections between elements can be made with wax marker on vinyl front panel by instructor or students. LDT contains the following logical elements with their positions indicated on the front panel: (12) two-input NOR gates; (6) three-input NOR gates; (6) four-input NOR gates; (6) inverters; (4) buffers; (12) J-K flip-flops; (4) full adders; (10) input switches; (10) indicator lights; (1) automatic clock pulse; (1) manual clock pulse.

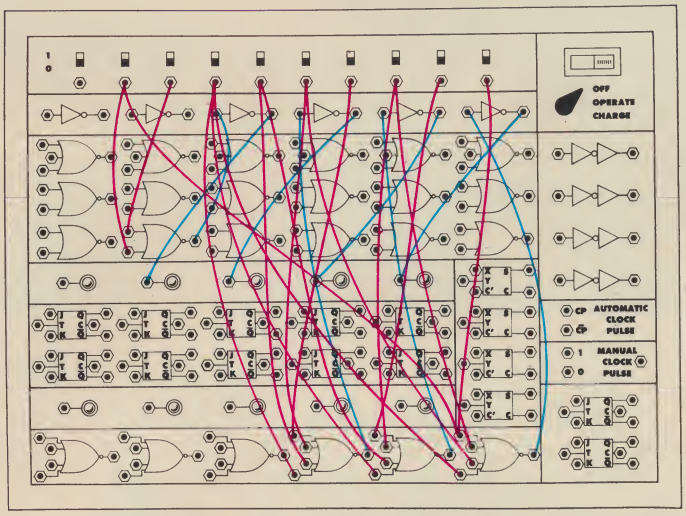


Illustration shows wiring for Decimal-to-Binary Converter.

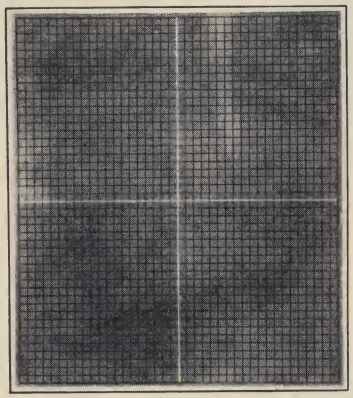
Dimensions: 26½″ h x 27″ w x 3″ d. Weight 15½ lbs. Complete as described with leads, batteries, battery charger unit, line connecting cord, and instruction manual.

Z-8500 . . . . . 445.00

Chalkboards

LAPINE GRAPH BOARDS

These accurately ruled boards are helpful for all math classrooms. The graph systems are permanently silk-screened on durable green chalkboard panels which are framed in satin-finished anodized aluminum and equipped with hangers. Graph lines are black, major axes yellow. Boards may be hung or set on chalkboard tray. Dimensions are 42" x 48".

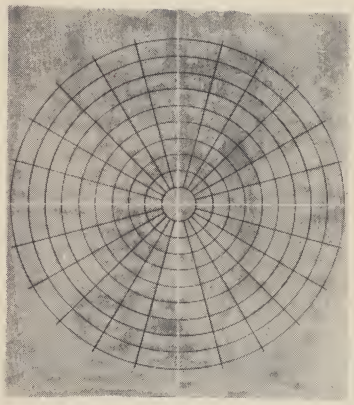


Z-0752

RECTANGULAR COORDINATE BOARD — Permanently screened 1" squares; X and Y axes are shown in yellow.
Z-0752 ..... **35.00**

POLAR COORDINATE BOARD — Ten concentric circles are arranged each 2" apart; radii are shown in 15° graduations; 0°—180° and 90°—270° in yellow.
Z-0751 ..... **35.00**

REVERSIBLE GRAPH BOARD — This economical unit contains the rectangular coordinate graph Z-0752 on one side and polar coordinate system (Z-0751) on other side.
Z-0755 ..... **49.00**



Z-0751

LAPINE 16 FOOT MATHROOM CHALKBOARD

These self-contained, ready-to-hang units are ideal for new mathrooms, or for modernizing existing math facilities. All models are 4' high and 9' or 16' wide, available as magnetic (steel) or non-magnetic chalkboards with eye-saving green writing surfaces. Boards are ¾" thick, mounted in a heavy gauge anodized aluminum frame.

These Features are Standard Equipment:

Sliding Protractor Rule — Permits accurate diagramming and measurement of angles. 30" plastic ruler has ¼" calibrations. It can be rotated a full 360°, and moves along the aluminum "T" on nylon rollers. Protractor rule slides along map rail.

Map Rail — Full length, with cork insert and display hooks.

Chalktrough — Full length, heavy gauge anodized aluminum.

Graph Systems — Permanently screened-on polar coordinate and rectangular coordinate graph systems are available on magnetic (steel) or non-magnetic chalkboards. Graph lines are black with major axes in yellow. On these models 9' of chalkboard writing surface separates the graph systems. **Sliding reversible graph systems** are offered for magnetic (steel) and non-magnetic chalkboards. The reversible graph board contains a rectangular coordinate graph on one side, and a polar coordinate on the other. The unit rolls along the same track as the protractor rule. 16' of chalkboard are available for writing. Graph board dimensions are 42" x 48".

REGULAR CHALKBOARD (Non-Magnetic) — 9' chalkboard with graph systems screened on. Weight 400 lbs.
Z-0741 ..... **160.00**

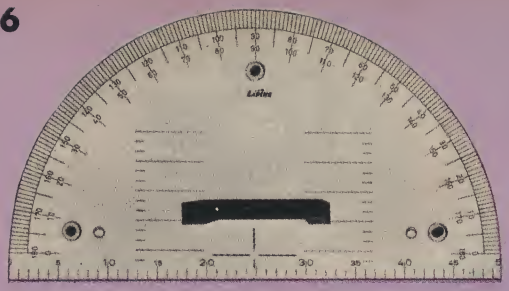
MAGNETIC CHALKBOARD (Steel) — Similar to Z-0741, but steel for use with magnetic numerals, etc. Weight 285 lbs.
Z-0742 ..... **285.00**

REGULAR CHALKBOARD (Non-Magnetic) — 16' wide, with sliding reversible graph board. Weight 400 lbs.
Z-0746 ..... **187.00**

MAGNETIC CHALKBOARD (Steel) — Similar to Z-0746, but chalkboard is steel. Weight 300 lbs.
Z-0745 ..... **315.50**

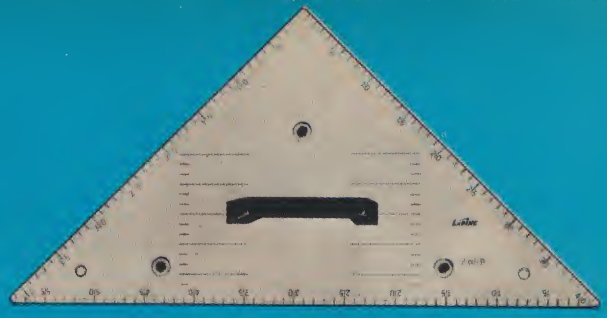
PROTRACTOR RULE — Same unit as included with LaPine Mathroom chalkboards. May be purchased for installation on existing facilities. With four 4-ft. sections of track.
Z-0753 ..... **29.50**

EXTRA TRACK SECTIONS — 4' track sections as supplied on LaPine Mathroom Chalkboards.
Z-0754 ..... **3.90**



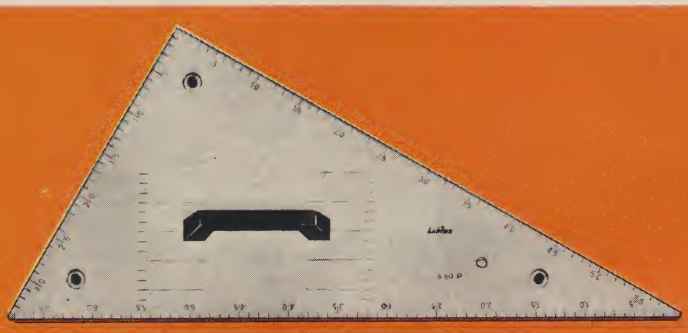
PROTRACTOR 180° protractor has 50 cm base length with 1 cm divisions. Double scale (clockwise and counterclockwise) graduated in 1 degree divisions with longer lines at 5 and 10 degree intervals. Numbered every 10 degrees. Two sets 14 parallel reference lines with 1 cm spacing. Red center markings. Plexiglas.

Z-3951 ..... **5.70**



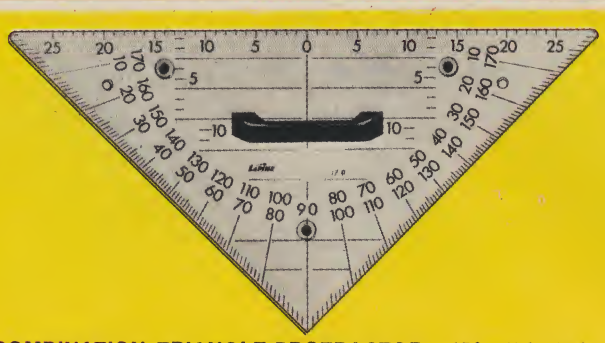
TRIANGLE 45°, 45°, 90° triangle has 60 cm base length. Scale on all sides with 1 centimeter divisions. Two sets 14 parallel reference lines with 1 cm spacing. Plexiglas.

Z-3952 ..... **5.70**



TRIANGLE 30°, 60°, 90° triangle with 70 cm base length. Scale on all sides with 1 cm divisions. Two sets 14 parallel reference lines with 1 cm spacing. Plexiglas.

Z-3953 ..... **5.70**



COMBINATION TRIANGLE-PROTRACTOR 45°, 45°, 90° triangle and 180° protractor. 60 cm base length with 1 cm divisions, center zero. Also double scale protractor (clockwise and counterclockwise) in 1° divisions with longer lines at 5 degree and 10 degree intervals. Parallel reference lines with 1 cm spacing. Plexiglas.

Z-3954 ..... **6.40**

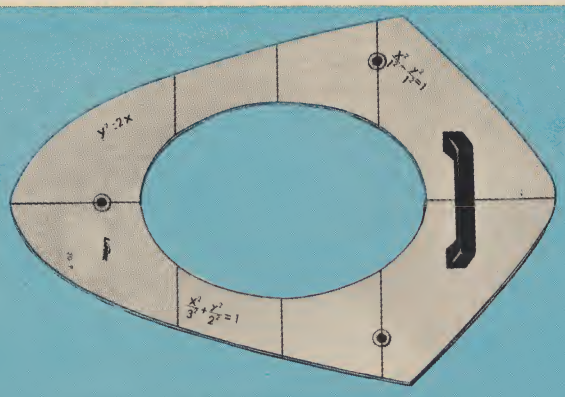
NEW FROM LAPINE

Demonstration Size Chalkboard Drawing Aids

THE FINEST INSTRUMENTS REASONABLY PRICED!

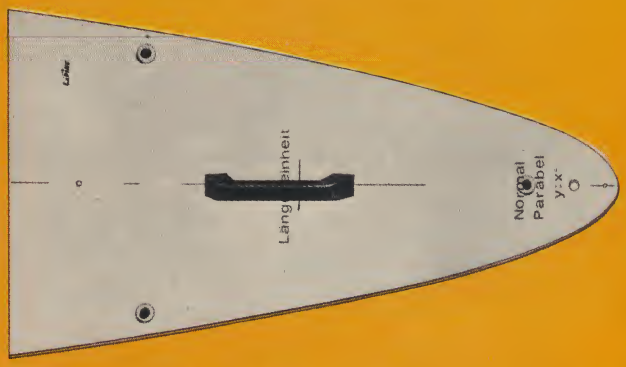
- Choose Transparent Plexiglas® or Opaque White Plastic units.
- Easily read deep engraved graduations (yellow on Plexiglas or black on white plastic instruments).
- Soft Plastic Spacers Prevent Sliding and Damage to Chalkboard or Drawing Aids.
- Sharp Mar-Proof Edges.
- Large Handle-grips.
- Parallel Reference Lines on Plexiglas Units.

® Rohm & Haas Co.



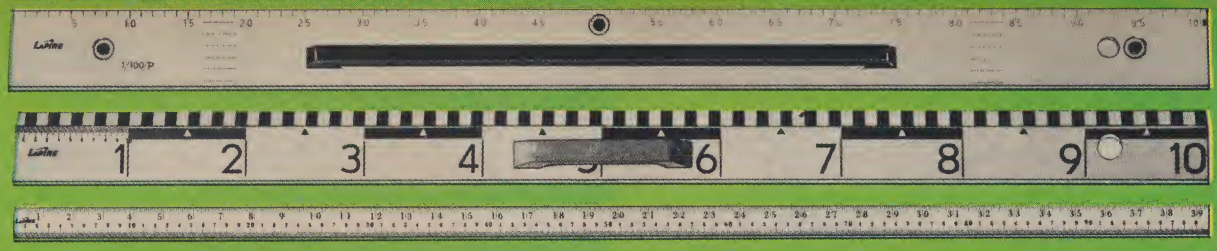
CONIC SECTION DRAWING AID Parabolic curve at one end and hyperbolic curve at the other end; complete ellipse in cut-out area. 60 cm long. Focal point of parabola is marked and also has reference hole. Curve formulas are imprinted. Plexiglas.

Z-3955 ..... **7.40**



NORMAL PARABOLA Base approximately 35 cm and height approximately 60 cm with formula, unit length, and focal point marked, and with hole at focal point. Plexiglas.

Z-3956 ..... **6.60**



CHALKBOARD RULER Length 100 cm; with 1 cm divisions. Two sets 6 parallel reference lines with 1 cm spacing. Plexiglas.

Z-3958 ..... **5.30**

CHALKBOARD RULER One meter scale with each centimeter alternately black and white. Each decimeter numbered and alternately marked in red; first decimeter has 1 mm graduations, numbered each centimeter. Arrow markings every 5 cm. Top edge beveled.

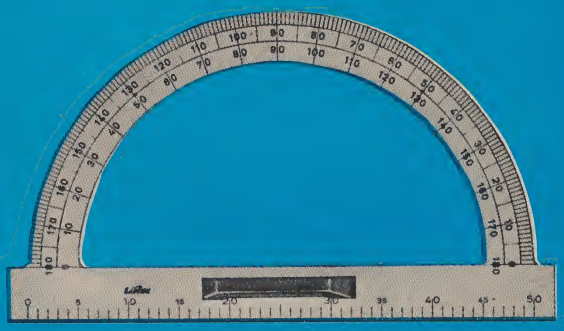
Z-3960 ..... **3.00**

WHITE PLASTIC METER STICK Flexible impact resistant opaque white plastic meter stick with black engraved graduations and numerals, easily visible at a distance. Will not warp, crack, or splinter. Dimensionally stable and moisture resistant — can be cleaned with a damp cloth. Both edges on one side graduated in millimeters with long lines at 5 mm and 10 mm, numbered each centimeter. Other side has 1 metric scale graduated as above, and English scale graduated to 1/16 inch, numbered each inch.

Z-3959 ..... Each **2.05**
Per Dozen **22.14**

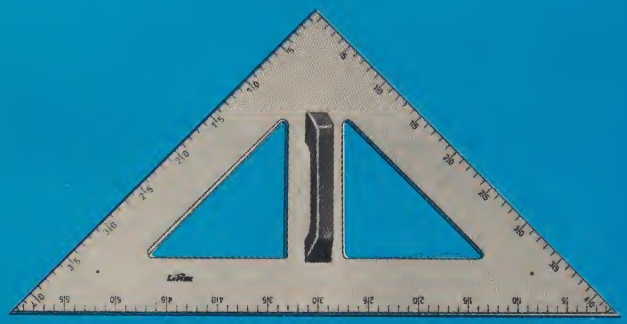
UNIVERSAL DRAWING AID Parabolic and hyperbolic curves on outer edges. Full ellipse in cutout area. Protractor is graduated 180 x 5 degrees, and linear scale is graduated 0-60 x 1 cm. Plexiglas.

Z-3957 ..... **14.20**



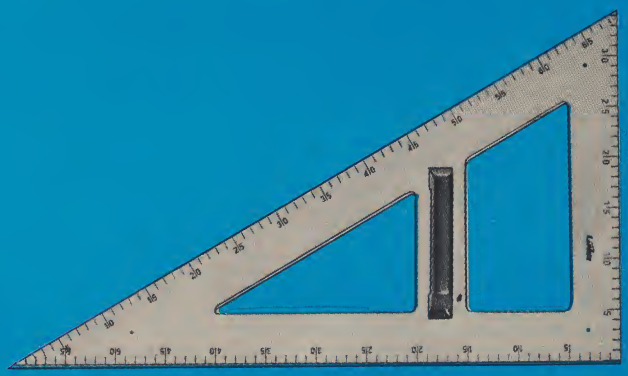
PROTRACTOR 180° protractor has 50 cm base length with 1 cm divisions. Double scale (clockwise and counterclockwise) in 1 degree divisions with longer lines at 5 cm and 10 cm intervals. Numbered every 10 degrees. Center cutout. Opaque white plastic.

Z-3961 ..... **4.50**



TRIANGLE 45°, 45°, 90° triangle has 60 cm base length. All sides have 1 centimeter divisions numbered every 5 cm. Center cutouts. Opaque white plastic.

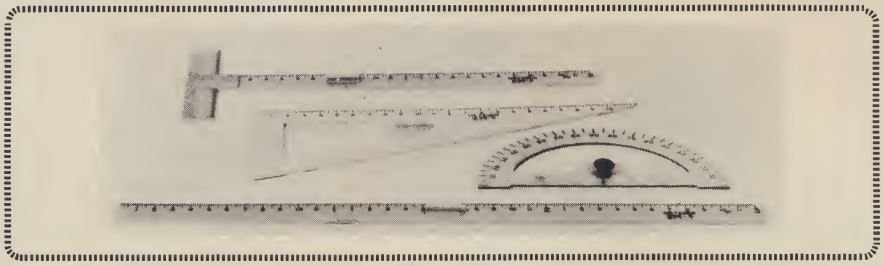
Z-3962 ..... **3.30**



TRIANGLE 30°, 60°, 90° triangle has 70 cm base length. All sides have 1 centimeter divisions numbered every 5 cm. Center cutout. Opaque white plastic.

Z-3963 ..... **3.30**

Chalkboard Drawing Aids



CHALKBOARD DRAWING SET

Set consists of one each of the following wooden instruments, which may also be ordered separately:

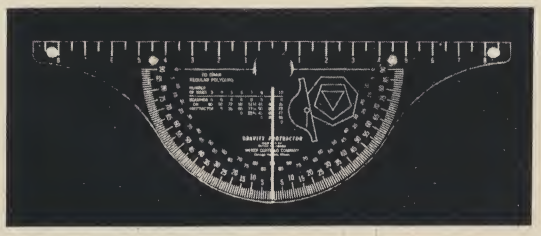
Z-3912 T-SQUARE 24 inches **2.95**
Z-3913 STRAIGHTEDGE 36 inches **2.00**
Z-3914 TRIANGLE 24 inch, 25°-65° **2.50**
Z-3915 PROTRACTOR 15½ inches **4.00**
Z-3917 SET of 4 instruments as detailed above **10.50**

Z-9040

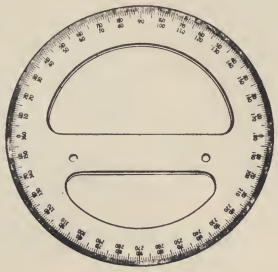
COMPASS — For drawing geometric figures. Made of wood with split holders for chalk on one leg and a rubber tip on the other. With clamp device. 16½" long.
Z-9040 ..... **1.75**

Z-8825

METAL COMPASS — Sturdy metal compass; jointed metal legs assure accuracy and ease of use. One leg has rubber pivot tip; other leg has adjustable chalk holder. 12 in. long.
Z-8825 ..... **4.95**

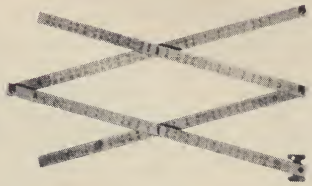


GRAVITY PROTRACTOR — Combines in one piece an 18-inch straight edge, T-square, ruler, protractor and angles. Straight edge is marked in half inches, protractor in single degrees. Body is made of transparent plexiglass. Heavy metal pointer hangs down from center to mark degrees.
Z-8821 ..... **7.50**

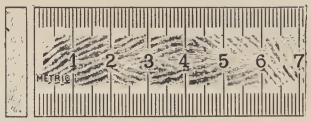


CIRCULAR PROTRACTOR — Of heavy transparent plastic, 10" diam. Scale divisions are in units of 1° from 0° to 360°. Each interval of 10° is numbered along the edge.
Z-8847 ..... **4.00**

PANTOGRAPH — For reducing or enlarging subjects up to 25 ratios. Made of select hardwood, 21 inches long.
Z-8818 ..... **4.50**



Z-8818

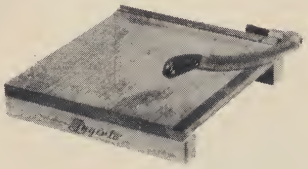


230-96

METER STICK — Made of maple with metric and English markings.
230-96 ..... **1.02**

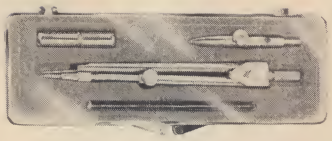
PARALLEL RULES — 24 inch size. Made of black vinyl, meet government specifications. Equipped with friction pads to prevent slipping. All metal parts are corrosion resistant.
Z-9032 ..... **6.00**

POINTER — Smoothly finished hardwood. Has rubber point and an eyelet for hanging. Overall length 37 inches.
Z-8819 ..... **0.55**



PAPER CUTTER — Convenient cutter-trimmer for all weights of paper, light cardboard and soft metal in thin sheets. Birch board, 15"x15", subdivided by half inch squares. Metal base with graduated rule on one side. 15 inch steel blade.
Z-8822 ..... **26.50**

Drawing Tools for Students

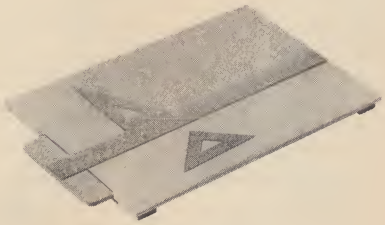


DRAWING INSTRUMENT SET

A fine-quality basic drawing set complete with compass, divider points, pen point, ruling pen, lead capsule with spare leads. Includes protective see-thru carrying case. Solid brass-nickel plated instruments.

Z-8974 ..... **2.40**

Per Dozen..... **24.00**



DRAWING SET

Board is specially constructed so that T-square and triangles can be stored, locked in position at bottom side of the board. Consists of 13"x19" drawing board, 14" T-square 30/60/90° triangle, and 45/45/90° triangle.

Z-9001 ..... **5.00**

FRENCH CURVE SET

This complete set consists of eight curves of 0.90 thickness. Non-flammable. Crystal clear plastic. Overall from 6" to 10½".

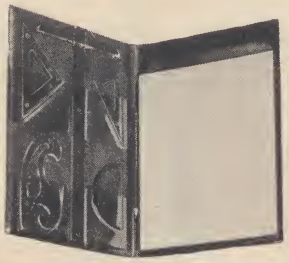
Z-9009 ..... **5.25**

FRENCH CURVE

10", clear plastic, 0.90 thick. Non-flammable.

Z-9007 ..... Each..... **.75**

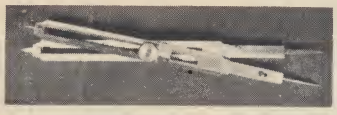
Per Dozen..... **7.92**



PDQ PORTFOLIO DRAWING KIT

13½"x9½". Folding vinyl portfolio with five useful drawing aids, graph pad and drawing pencil. Transparent pockets hold 30/60 degree and 45/90 degree triangles, laminated protractor, French Curve and a 12" calibrated T-square with inch and millimeter scales.

Z-9005 ..... **3.50**



PROPORTIONAL DIVIDERS

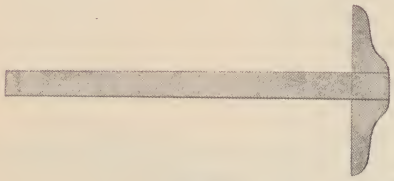
A direct reading instrument 7½" in length. Rack and pinion are nickel-silver, with points and bilts of stainless steel. Graduated for lines and circles. Circles can be divided from 4-20 equal parts. Lineal proportions range from ¾ : 1 to 10 : 1. Replaceable points.

Z-9000 ..... **23.50**

ADJUSTABLE HEAD T-SQUARE

Adjustable protractor head is clearly marked to 180°, with indicator on arm for easy setting at any angle. Transparent plastic. Adapted for no-smudge ink or pencil ruling. 18-inch arm. Head fits snugly against side of board.

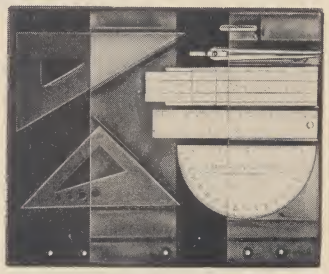
Z-9010 ..... **3.60**



T-SQUARE

Precision made with edges of hairline accuracy. Transparent plastic. Arm is fitted into specially cut recess to insure even greater rigidity and accuracy than most T-squares. 18-inch arm.

Z-9008 ..... **2.00**



RING BINDER DRAFTING SET

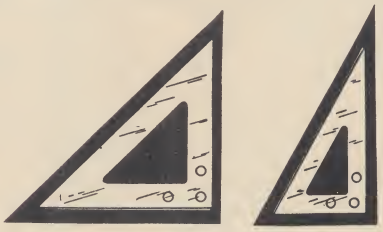
Made to fit all standard 2 and 3 ring loose leaf binders. Vinyl fitted pockets hold 4" 45°-90°, 6" 30°-60° triangles, protractor, 6" Mannheim slide rule, 6" ruler, compass-divider, and spare leads. Information card on back gives detailed tables required for natural trigonometric functions, four-place logarithms, all angle formulas, and weight and measure tables.

Z-9003 ..... **2.49**

STENCIL LETTERING SET

Used to aid in the rapid, uniform lettering of graphs and drawings. Complete alphabet, all numbers and commonly used signs on each guide. Most letters formed in one operation. Each guide has an undercut so as to prevent ink smears. 6 guides: 1/8, 3/16, 1/4, 5/16, 3/8, and 1/2 inch sizes.

Z-8829 ..... **10.75**



Z-9006 **Z-9004**

TRIANGLE 45/90°

All triangles have finger lifts. Made of sturdy material. .080" thick. Double bevel in triangular cutout allows easy pick-up. 10" vertical.

Z-9006 ..... Each..... **1.05**

Per Dozen..... **10.56**

TRIANGLE 30/60°

Similar to Z-9006 triangle, except 30/60°.

Z-9004 10" vertical ..... Each..... **.75**

Per Dozen..... **7.56**

TRIANGLE SET

6"-45° and 8"-30°-60°-90°. With beveled edges and recessed lifts on both sides for quick pick-up. Set includes 1 each 6"-45° and 8"-30°-60°-90° triangles. Non-smear inking edges.

Z-8975 ..... **1.20**

Per Dozen..... **12.00**

L-Lower elementary. U-Upper elementary. J-Junior high school. A-Algebra. G-Geometry. T-Trigonometry.

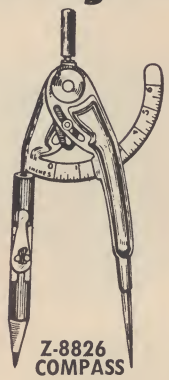
Drawing Tools

Z-8976

COMPASS-DIVIDER

Metal — Collet holds steel point as well as lead. With capsule of leads.

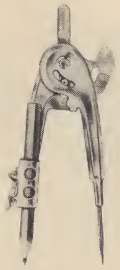
Z-8976 ..... Per Dozen **3.60**



Z-8826
COMPASS

Clear, accurate calibrations. Arc pointer sets accurate radii; screw adjustment. Plated steel. With pencil.

Z-8826 ..... Per Dozen **3.60**

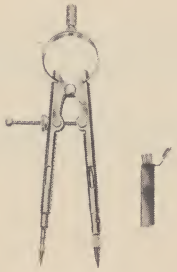


Z-8977

BALL-BEARING COMPASS

Graduated radius arc. Ball-bearing control. Accurate circles to 12" dia. Nickel plated.

Z-8977 ..... Per Dozen **3.00**

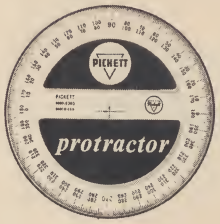


Z-8978

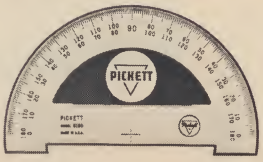
BOW COMPASS-DIVIDER

Large combination instrument with needle points, interchangeable inking pen and pencil lead parts. Positive thumb screw adjustment. Includes cartridge of extra leads. Nickel plated steel.

Z-8978 ..... **1.00**



Z-8970



Z-8972

PICKETT PROTRACTORS

These transparent protractors are scratch-resistant plastic, highly accurate and precision engraved. Sharp black graduations. Beveled center bar.

6" Full CIRCLE (360°)

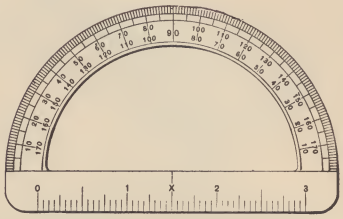
Z-8970 ..... Each **1.25**

4" SEMI-CIRCLE (180°)

Z-8973 ..... Each ..... **.40**

6" SEMI-CIRCLE (180°)

Z-8972 ..... Each ..... **.65**

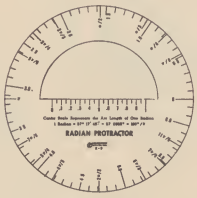


Z-5152

4" PROTRACTOR

Metal — Divided in 1° graduations. Center cutout.

Z-5152 ..... **.25**



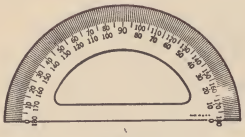
Z-9013

RADIAN PROTRACTOR

Measure angles in radians; construct radian angles. Find areas of circular sectors and segments. Center scale represents the arc length of one radian. 1 radian = 57° 17′ 45″ or 57.2958°. Diameter 4 inches.

Z-9013 ..... **.75**

Per Dozen **7.20**



Z-9014

PROTRACTOR

3½" — With cut-out center. Graduated in 1° markings.

Z-9014 ..... Per Dozen **1.20**

Z-5140

4" PROTRACTOR

Plastic — 2⅛" size with 4" diameter. Laminated printing. 1° graduations.

Z-5140 ..... **.20**

Per Dozen **1.80**

6" Protractor

Plastic — Same as Z-5140 but 6" diameter, sturdier, and ½° graduations. (Not shown)

Z-5150 ..... **.40**

Per Dozen **4.32**

Z-9023

PROTRACTOR-RULER

6", Plastic With 45° and 60° triangle cutouts; French curve symbol. Metric scale on one edge.

Z-9023 ..... Per Dozen **1.56**

PROTRACTOR-RULER

12"x12" — Protractor, ruler, angle finder, triangle, and right angle all in one. Marked with inches, metric measure, architects scale, and inches in tenths.

Z-9022 ..... Each **1.00**

NEW MATH RULER

4-in-1 Has scales of 1/16", 1/10", metric, and number line. Covers all school needs. Calibrations recessed, sharp, clean, accurate. Heavy plastic.

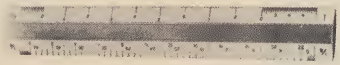
Z-8979 ..... Per Dozen **4.80**

Drawing Tools and Papers – Notebook Charts

12" RULER

Transparent plastic. One edge to sixteenth inches; opposite edge in centimeters. Beveled edges. Fits ring binders.

Z-9020 ..... Per Dozen **1.80**



ARCHITECTS SCALE, 6"

Plastic Four beveled scales. Graduations ⅛, ¼, ½, 1, ⅜, ¾, 1½, 3" to foot.

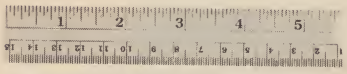
Z-9027 ..... Each **1.50**

Per Dozen **16.20**

12" ARCHITECTS SCALE

10 different scales—from $\frac{3}{32}$" to 3". Clear graduations and figures are recessed. White with color-coded grooves in red, green, black.

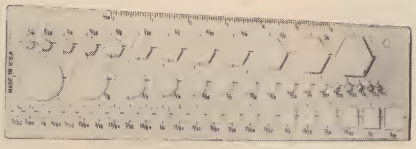
Z-8980 ..... **1.50**



ENGLISH AND METRIC RULER

12" – 1 inch wide, with $\frac{1}{16}$" markings on one edge and metric on other.

Z-9021 ..... Per Dozen **1.44**

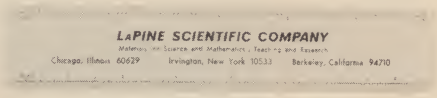


GEOMETRY TEMPLATE

Useful for flow diagramming. Transparent. Contains hexes, circles, and squares from $\frac{1}{16}$" to 1". One edge beveled with a 6" scale in sixteenths.

Z-9026 ..... Each **1.80**

Per Dozen **18.00**

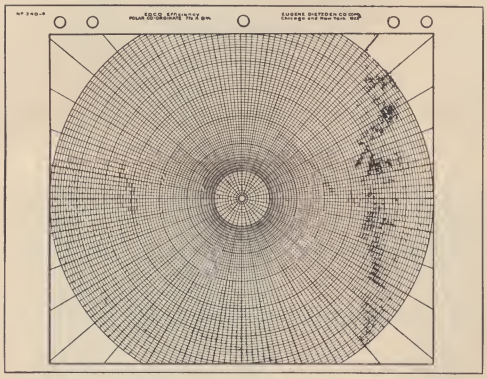


6" PLASTIC POCKET RULE

Heavy Gauge – One edge has metric scale divided to centimeters and millimeters; other edge graduated in inches to sixteenths.

230-61 ..... **.15**

Per Dozen **1.56**



Z-8894

GRAPH PAPER—8½"x11" – A good selection of graph paper. Fine quality drawing paper, printed in green ink. Standard punched 5 holes. 100 sheets per package.

Cat. No.	Description	Pkg. 100
Z-8891	Semi-Log 1 log cycle, 1 direction	3.60
Z-8892	Semi-Log 2 log cycles, 1 direction	3.60
Z-8893	Semi-Log 2 log cycles, both directions	3.60
Z-8894	Polar Coordinate numbered every 10°	3.60
Z-8895	Rectangular Coordinate, 10 squares per inch	3.60

Notebook Charts and Graph Paper

NOTEBOOK LOG AND TRIG CHARTS – Printed in green and black on heavy stock, 8½"x11". 5 holes punched, fits all notebooks.

COMMON LOGARITHMS – These charts show 4 place common logs with proportional parts. Supplied in package of 25 charts.

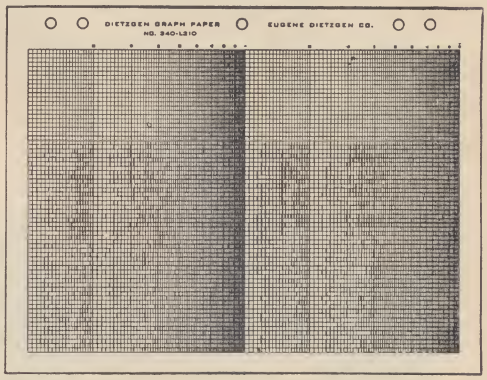
Z-8837 ..... **2.50**

NATURAL FUNCTIONS – These charts show in 10 minute intervals, converting minutes to degrees. Sine and cosine on one side, tangent and cotangent on reverse. Supplied in package of 25 charts.

Z-8838 ..... **2.50**

LOGARITHMS OF TRIG FUNCTIONS – This chart features a time saving column finder. Supplied in package of 25 charts.

Z-8839 ..... **2.50**



Z-8892

DATA GUIDES – Excellent summary-reviews of entire subjects, each on a solid plastic looseleaf chart. 8½"x11", punched to fit all notebooks. Clear—concise.

Z-8680 Modern Algebra 1
Z-8681 Basic Algebra
Z-8682 Intermediate Algebra
Z-8683 College Algebra
Z-8684 Analytic Geometry
Z-8685 Plane Geometry
Z-8686 Trigonometry
Z-8687 Differential Calculus
Z-8688 Integral Calculus
Z-8689 Slide Rule Guide

Each ..... **.79**

Z-8690 ..... Set of 10 ..... **7.00**

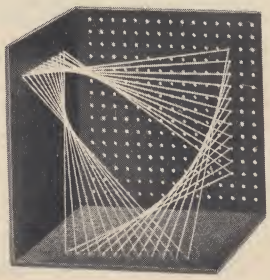
SPACE SPIDER – By setting up the three perforated planes to form a hollow corner, the student can weave geometric models with elastic cord in colors. Panels are 6" square. Complete with elastic cord, clips and needle.

Space Corner – Kit for single Space Corner.

Z-8803 ..... **3.95**

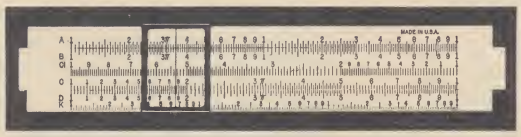
Six Space Corners – Kit for six Space Corners including 18 black planes, 18 spools elastic cord in six fluorescent colors —enough for 50 projects.

Z-8802 ..... **16.95**



Pickett Slide Rules

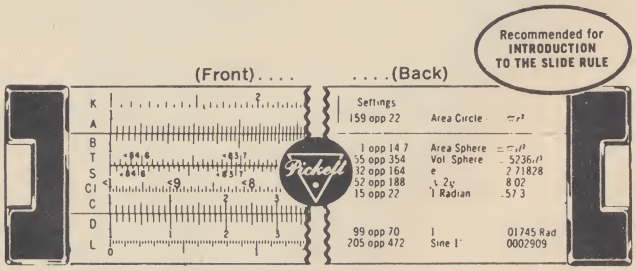
Free Instruction Manual Included With All Rules



BEGINNERS' SLIDE RULE — Wood rule with A, B, C, D, C1, K scales. Conversion tables on back.

Z-3042 ..... **1.29**

Per Dozen **12.00**

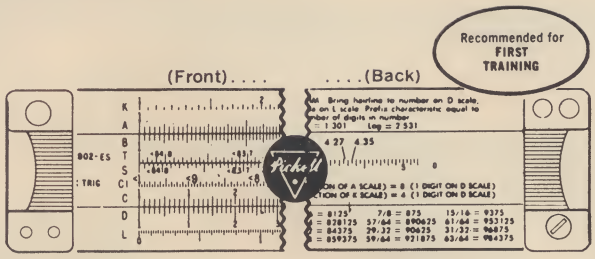


PLASTIC TRIG RULES — Solid impregnated plastic with fixed end plates, unbreakable cursor which can't slip off. 9 basic engraved scales: K, A, B, S, T, C1, C, D and L. White. Imitation leather case.

Z-3064 (Model 120) Front like above, plain back **1.95**

Z-3065 (Model 121) Like above but with equivalent tables on back **2.95**

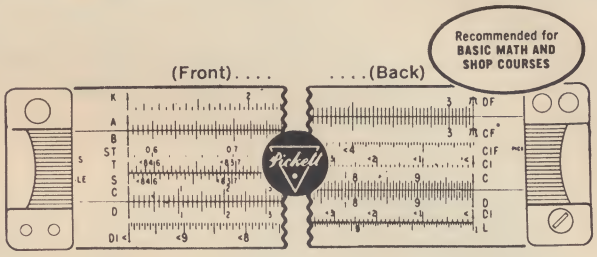
Z-3066 (Model 125) Scales K, A, B, C1, C, D and L on front, S, ST, T, C, D and decimal equivalents on back **3.95**



TRIG TRAINER — Metal; scales K, A, B, T, S, C1, C, D and L. Mathematical conversions, etc., on back. Imitation leather case.

Z-3046A (Model N902E) Yellow **5.95**

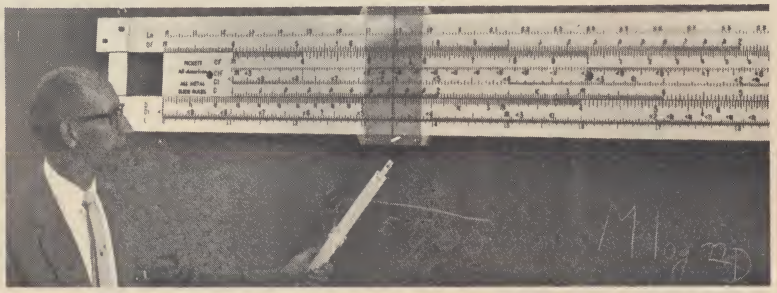
Z-3046B (Model N902T) White **5.95**



STANDARD TRIG RULE — (Model N 1010) Metal; 17 scales with C, D, and D1 on both sides, plus C1. All trig scales are on slide. Eye-saver yellow.

Z-3044A Leather Case **12.95**

Z-3045A Imitation Leather Case **12.00**



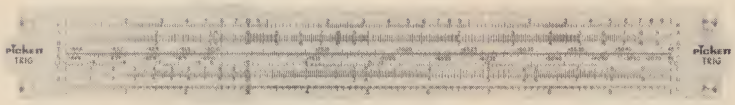
CHALKBOARD DEMONSTRATION SLIDE RULES

Large Pickett rules featuring log N and K, A, B, S, T, C1, C, D, and Log scales and those featured on standard trig rule (Z-3044) above. Yellow-green finish on plywood. With hard face plastic cursor, adjustable metal ends.

Z-3074 4' Demonstrator slide rule **15.00**

Z-3049 7' Demonstrator slide rule **35.00**

TRANSPARENT SLIDE RULES FOR OVERHEAD PROJECTION



Trig Slide Rule, 10" Long, Transparent — Containing the scales: A, B, C, D, T, S, C1, L, K. Extra-large graduations and bold numerals are laminated inside crystal-clear plastic. Complete with leather case and instruction manual.

Z-3041 ..... **10.00**

Log Log Slide Rule, 10" Long, Transparent — Containing the scales: C, D, D1, DF, CF, D1F, LL0, LL1, LL2, LL3. With leather case and instruction manual.

Z-3037 ..... **10.00**

SCHOOL SLIDE SETS

Slide Rule Set I — 24 Model N902E (Z-3046—yellow or white —specify) standard metal Trig Trainer slide rules; one 4-ft. long chalkboard demonstration rule (Z-3047); manual "A Teaching Guide for Slide Rule Instruction".

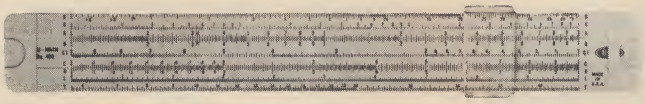
Z-3073 ..... **107.50**

Slide Rule Set II — 24 Model N902E (Z-3046—yellow or white —specify) standard metal Trig Trainer slide rules; one 10" long Trig Slide Rule (Z-3041); manual "A Teaching Guide for Slide Rule Instruction".

Z-3074 ..... **107.50**

L-Lower elementary. U-Upper elementary. J-Junior high school. A-Algebra. G-Geometry. T-Trigonometry.

Slide Rules and Measurement Tools



10" STUDENT TRIG SLIDE RULE

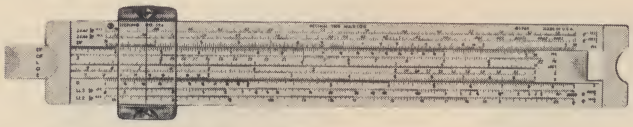
Scales S, K, A, B, C1, C, D, L, and T are engraved on the face for permanent accuracy. This rule is constructed of sturdy laminated vinyl. The cursor is made of clear optically correct plexiglass. With vinyl case and instruction manual. Eye-Saver yellow.

Z-3083 ..... **1.95**

10" STUDENT SLIDE RULE

In addition to matched scales A, B, C, C1, D, K, S, L, T, this rule has 10" scales in $\frac{1}{16}$ths on one edge plus a .050's on the other. Clear cursor and two-color red and black calibrations. Comes packaged in a protective leatherette case. Color: White.

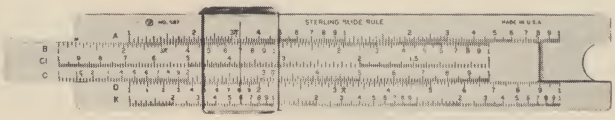
Z-3085 ..... **1.98**



10" DECIMAL TRIG LOG-LOG SLIDE RULE

Complete with 22 scales in a functional grouping for mathematics, science and engineering. Covers full Log-Log and Trig requirements. Includes double-faced adjustable spring loaded lucite cursor, complete operating instruction manual and protective scabbard. Color: White.

Z-3084 ..... **3.49**

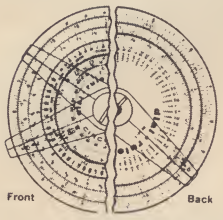


6" POCKET SLIDE RULE

Accurately calibrated scales—A, B, C, C1, D, K, S, L, T. Permanently engraved faces. Complete with spring loaded lucite cursor. In pocket size vinyl leatherette scabbard containing full operating instructions. Color: White.

Z-3062 ..... **1.20**

Per Dozen **12.00**



Z-3043

CIRCULAR SLIDE RULE

Pickett Model 101. 4½" diameter rule is yellow metal. With 16 basic scales for finding solutions to problems in multiplication, division, logs, trig, roots, addition or subtraction of fractions. Drill and thread relationships, metric conversions, decimal equivalents table included. Instruction manual; leather case.

Z-3043 ..... **3.95**

Per Dozen **39.48**

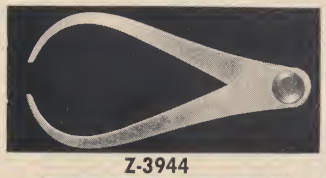
CIRCULAR SLIDE RULE KIT

A complete do-it-yourself special-purpose slide rule kit containing a set of circular slide rule blanks; circular scale plotter and cursor-straight edge; 30 page instruction booklet with examples; cutting tool.

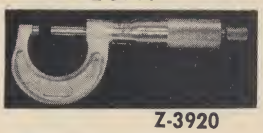
Z-3070 ..... **10.00**

Z-3070

Z-3942

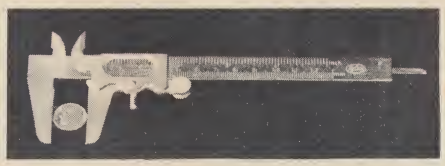


Z-3944



Z-3920

Z-3945



231-61

CALIPERS — 6" long, good quality steel.

Z-3942 Inside ..... **1.60**; **Z-3944** Outside **1.60**

STUDENT VERNIER CALIPER

Plastic — Excellent for studying outside, inside, depth and step measurement. Reads to 5" with decimal and fractional inch scales on front. Millimeter scale to 128mm on reverse side. Readings to .001", 1/128", 0.1mm. With instructions; in individual snap-tight plastic case.

Z-3945 ..... **3.00**

Per Dozen **30.00**

VERNIER CALIPER — Overall 7½". Reads to 5" and 120 mm. Vernier readings to 1/128" and 0.1 mm. For inside, outside and depth measurements. High quality steel with deep etched engraving. With flexible case.

231-61 ..... **8.75**

MICROMETER CALIPERS — Overall 4¾". Calibrated both English and metric. Catalog numbers 231-51 and 231-56 have lock nut and ratchet, and decimal equivalents on frame. Others are student grade instruments.

Catalog No.	231-51	Z-3920	231-56	Z-3921
Range	1 inch	1 inch	25 mm	25 mm
Subdivision	0.0001	0.001	0.01	0.01
Each	12.75	9.65	12.75	9.65

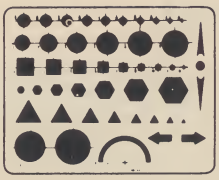
MEASURING TAPES

STEEL, decimalized. 100 ft. long, graduated every foot in 10ths and 100ths of a foot. Vinyl covered steel case.

Z-8836 ..... **10.00**

LINEN. 50 ft. long; regular divisions in feet, inches and ¼ inches.

Z-3899 ..... **4.50**

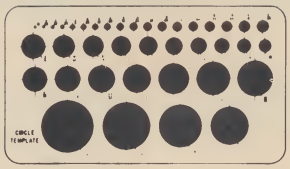


Z-9790
Z-9791

GENERAL USE — With 48 openings for those working with pencil technique exclusively. 6"x4¾"x.030".
Z-9790 ..... * **1.00**

GENERAL USE—JR. — Pocket size model of Z-9790. 3"x2⅜"x.020".
Z-9791 ..... **.75**

Z-9792



Z-9793

***TEMPLATE SET**

SET OF 6 — Ideal selections economically priced for the math teacher; provides 1 each of these templates: Z-9790, Z-9792, Z-9793, Z-9794, Z-9795, and Z-9796.
Z-9799 ..... Per Set **10.00**

Z-9794

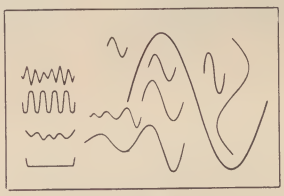
CURVES—TANGENTS — Frequently used radii. Tangents in several degrees. Scale 1:10. 4¾"x4½"x.030".
Z-9792 ..... * **1.40**

CIRCLES — 39 circles from $\frac{1}{16}$" to 1⅜" diameter. 7¼"x4"x.030".
Z-9793 ..... * **1.00**

MATH AND CHEMICAL SYMBOLS — Helpful student aid. 5"x3"x.030"
Z-9794 ..... * **1.75**

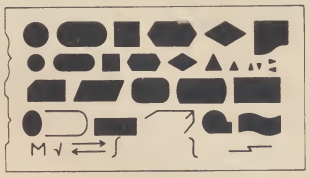
Z-9795

MASTER ELLIPSES — Projections of 15°, 25°, 35°, 45°, 55°, and 65° in sizes from ⅝" to 1⅜". 24 ellipses. 9"x5"x.030"
Z-9795 ..... * **2.25**



Z-9796

SINE CURVES AND WAVE FORMS — Synchronized and normal sine and modulated wave forms. 8¼"x5½"x.030".
Z-9796 ..... * **3.00**



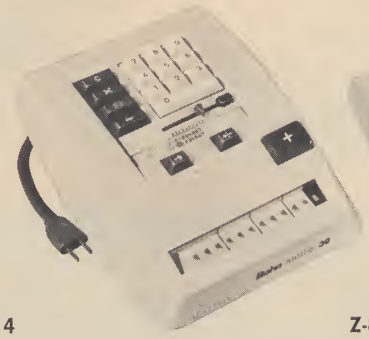
Z-9797

DATA PROCESSING MACHINES AND SYSTEMS — Most commonly used symbols for data processing machines and systems. 9"x5¼"x.030".
Z-9797 ..... * **3.00**

Bohn Calculators

Z-8513

Z-8514



Z-8515

Z-8516

ADDING MACHINE

Automatic, Electric Combines portability with heavy-duty performance. Automatically adds, subtracts, multiplies; prints every step, every answer, including total, subtotal, and true credit balance, on 2½" tape; enters 10 and totals 11 columns. Powerful 180 rpm motor triggers instant response from short stroke (⅛") 10-key keyboard; can be operated with either hand. All-steel frame and steel mechanism; two-tone gray styrene housing; with dust cover. Dimensions 9¾" l x 7⅝" w x 5" h; weighs 8½ lbs. For 110 volts, 60 Hz.
Z-8513 ..... **129.50**

MANUAL CALCULATOR

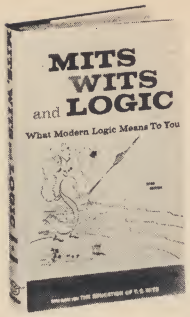
Portable, Full-Featured Unique design permits amazing compactness, versatility, speed, and durability. The 10-key keyboard is designed for touch-system operation with either hand. Provides quick answers in addition, subtraction, multiplication, and division without special training; enters 10 and totals 11 digits. Palm-actuating bar operates machine as fast as many electrics. Interior parts of rugged Swedish steel; unitized construction. Dimensions 10" l x 7" w x 3¾" h; weighs only 6 lbs. With dust cover.
Z-8514 ..... **139.50**

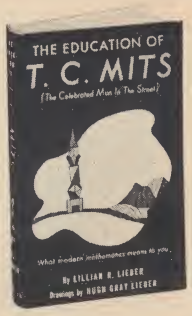
ELECTRIC CALCULATOR

Automatic Multiplication · Adds, subtracts, divides, and multiplies automatically; figure work is virtually eliminated. Feather touch key response assures comfortable, fast operation with either hand. Features: fool-proof key lock system; rapid shift key; multiplication with constant factor; simplified machine clearance; enters 10, totals 11 digits. Unitized construction; operating speed up to 360 rpm; tough attractive case; with dust cover. Dimensions 10¼" l x $8\frac{3}{16}$" w x 4" h; weighs 8 lbs. For 110 volts, 60 Hz.
Z-8515 ..... **249.50**

ELECTRIC CALCULATOR

Fully Automatic Division and Multiplication Has all features described for No. Z-8515 plus two special division keys and a stop key to halt division at desired decimal point; also a special quotient register scale for division. Automatically divides and also multiplies with a constant factor; also does negative multiplication. Handles problems usually assigned to expensive, bulky calculators; answers are obtained without "in-between" operations. Dimensions 11¼" l x 8¼" w x 4¾" h; weighs 9½ lbs. With dust cover.
Z-8516 ..... **349.50**





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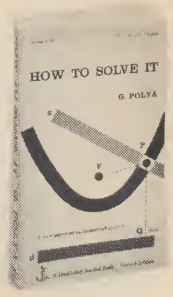

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Minidac Computer Function Demonstrator

The Minidac is a computer trainer which demonstrates the basic principles and operations of digital computer technology and illustrates computer design, programming, and circuitry. It is useful in schools where there is no computer available, and, in fact, is more practical as a teaching device than an actual computer. Because actual computers process so quickly, students cannot possibly follow functions step-by-step: thus, they are not practical for use in introductory courses. Computer trainers, however, add a reasonably paced visual dimension to the lesson, and the speed at which operations can be carried out can be fitted to the students level of skill.

MINIDAC 6010 — This trainer duplicates computer functions and shows—by doing—how computers use logic and make decisions. Minidac can be used to teach the circuitry for: The Binary Number System; Boolean Algebra; Digital Logic; Basic Input; Storage; Memory Circuits; Media and Codes; Simple Flip-Flop; Fast Flip-Flop; Oscillator; Delay Flip-Pulse Input; Delay-Flop Continuous Input; Binary Counter; Binary Addition, Subtraction, Multiplication, and Division. All procedures are clearly shown on the Minidac, and are fully described in the seven manuals which are included.

Circuitry is exposed for effective instruction. Students set up circuits by plugging in wires, setting switches, and pushing buttons in a step-by-step manner so they can learn the sequence of operations. The student begins with easily understood concepts. These are gradually synthesized to lead to an understanding of complex computer functions.

Seven graded manuals, fully illustrated, are included with each Minidac 6010. These manuals were developed by members of the faculties of MIT and Harvard University. More than 200 demonstrations are included in the Minidac manuals with chapters titled as follows:

I. **Getting Acquainted with Minidac.** Basic circuitry: includes series of programs to demonstrate functions and importance of each section of Minidac.

II. **What is a Digital Computer?** Basic input, storage, processing, and output functions.

III. **How Computers Make Logical Decisions.** Introduction to Boolean Algebra, Decision Making, Logical Problem Solving, and Simulation.

IV. **How Computers Do Arithmetic.** Introduction to Binary Number System and to devices used in computer arithmetic: The Counter, the Half-Adder, the Full-Adder, the Shift Register and Accumulator. Binary addition, subtraction, multiplication, and division. Binary-to-Decimal Conversion.

V. **How Computers Work for Man.** Detailed discussion of more than 25 programs in which Minidac demonstrates computer applications in business, science, and industry.

VI. **Minidac Games.** Illustrate computer logic and problem-solving.

VII. **Capacitor/Resistor Manual.** Modifications and improvements in basic circuitry with 24 experiments, including Fast and Delayed Flip Flops, Six-Bit Binary Counter, Automatic Five-Bit Counter, the Accumulator.

Programs set up on the Minidac console can be changed in minutes, enabling students to examine various computer operations in a single class period. Being used both as a demonstration and student experimentation device, Minidac is portable and easy to handle and operate. Its professional components are designed for intensive use. Students may be given direct access to the machine without fear of damage to expensive equipment.

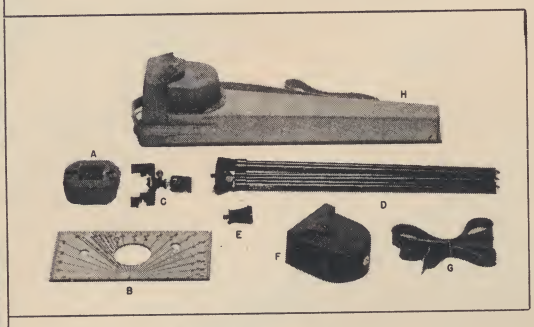
The unit comes assembled, tested, and ready for use. Plastic covered relays and switches are double pole, double throw. Terminals are solderless, snap-on type. Capacitors and wire wound resistors are included. For 105-125 volts, 60 cycles AC. Black metal case is 24" x 12" x 2¾". Shipping weight is 20 lbs.

Z-0270 ..... **285.00**

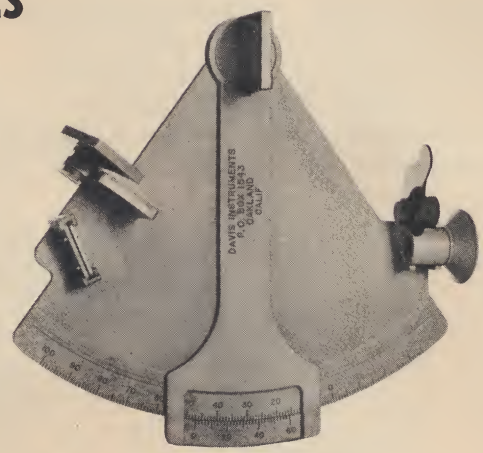
ADDITIONAL MANUALS — Additional set of 7 manuals for No. Z-0270.

Z-0272 ..... **Set** **15.00**

Levels and Transits



BRUNTON TRANSIT ACCESSORIES



BRUNTON POCKET TRANSIT

For Rough Surveying Can be used as a transit, level, plumb, clinometer, compass and alidade. Shows direction to one degree. Shows level, slope or grade within one degree. Essentially the Brunton Pocket Transit is a magnetic needle set in an accurately graduated circle, in a case which opens into a versatile sighting arrangement. In addition there is a level attached to a vernier for reading vertical angles. Weighs only 9 oz. 2¾"x3"x1⅛".

Z-2841	Brunton Transit in Quadrants	**53.55**
Z-2842	Brunton Transit 0-360°	**53.55**

Accessories

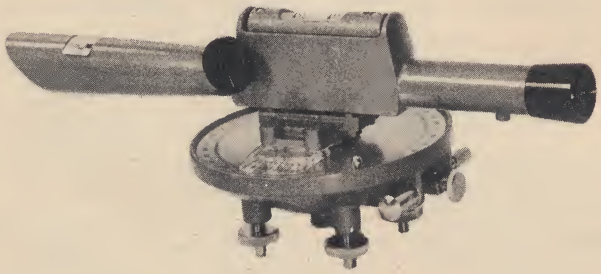
(B) Z-2834	Alidade Protractor	**6.00**
(C) Z-2835	Ball & Socket Head	**9.90**
(D) Z-2836	Tripod	**27.00**
(E) Z-2837	Jacobs Staff Thimble	**2.40**
(F) Z-2838	Polyethylene Case	**2.10**
(G) Z-2839	Strap for Case	**1.20**
(H) Z-2840	Leather Case	**18.00**

MARINE SEXTANT

Full 7" Arc-4 Sun Shades This instantly adjustable corrosion-resistant sextant has been used as the sole means of navigating both the Atlantic and Pacific oceans. Reads to within two minutes of arc. Rugged, full size instrument is used by professional, amateur and student navigators alike. The "earth mirror" is suited to the teaching of principles of navigation and other uses of the sextant for measurement of height of buildings, etc. Useful with beginning Trigonometry students.

Marine Sextant comes with manual "How To Find Your Position With A Sextant", which clearly explains: Position finding by the Sun; How to use the sextant as a pelorus; How to use the sextant as a heliograph; How to take sights with the artificial horizon when far away from the sea; Equation of time; Measuring the Sun's altitude; Finding longitude; The Complete Sight.

Z-5849 ..... **15.50**

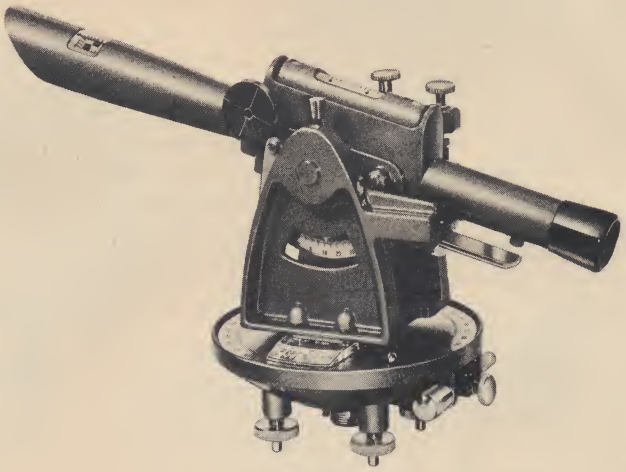


LEVEL

With Tripod And Rod 18x Power telescope with rack and pinion internal focusing, wide field of view and built-in sunshade . . . tapered design enclosed aluminum base offers easy access to leveling screws for fast set-ups even with gloved hands . . . solid brass, nickel plated clamp and tangent screws for precise telescope movement . . . leveling plate is self-lubricating . . . colored level vial . . . horizontal circle is divided in degrees, numbered both ways from 0 to 90 degrees . . . rotates for zero settings . . . transparent vernier reads to ¼ degree (15 minutes).

Wide frame steel leg construction type tripod features split legs with adjustable tension hinges. Rod is magnolia wood, extends easily and locks in any position. Replaceable tapes. Unit comes with fiberglass carrying case, plumb bob, and instructions. Weight 6½ lbs. (instrument only). Complete unit weighs 23 lbs.

Z-2843 ..... **92.50**



LEVEL TRANSIT

With Tripod and Rod Same construction features of No. Z-2843 Level plus tilting telescope . . . U-shaped one piece standard, like higher priced surveying instruments, has self-adjusting hold-down block to prevent telescope trunnion wear . . . lock lever is conveniently located beneath the scope and provides three-point locking action when instrument is used as a level . . . also has vertical clamp and tangent screws for extra fine telescope movement. Comes with tripod and rod (as described for No. Z-2943), plus carrying case of fiberglass, plumb bob, and instructions. Instrument weighs 7¾ lbs.; complete unit with case weighs 24¼ lbs.

Z-2844 ..... **143.40**

Audio-Visual Equipment

FILMSTRIP VIEWER

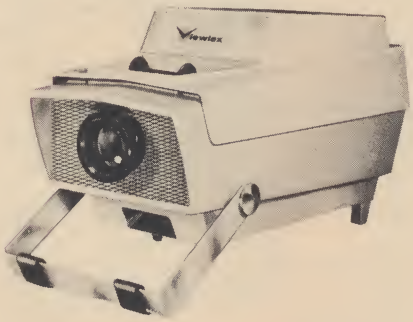
Viewlex "Previewer Jr". AC/DC Only—For hand held or desk-top viewing of 35 mm single frame filmstrips. Threads instantly, provides positive framing, always in focus. Convex optical viewing screen. Carrying handle serves as support stand. Light weight, die-cast aluminum construction—two tone finish. AC/DC. Overall size 7½x 3⅓"x3⅓".

Z-8531 ..... **17.95**

FILMSTRIP VIEWER

Viewlex "Previewer Jr", Battery, or AC/DC—Similar to No. Z-8531, but for AC/DC or battery operation.

Z-8532 ..... **19.95**



FILMSTRIP-SLIDE PROJECTOR

Viewlex "Little Giant"—Projects at distances from 9" to 16'. For single-frame 35 mm filmstrips and 2"x2" slides in any type mount. Easy framing for filmstrips with positive framing and film advance. Optically balanced (anastigmatic) condensing lens system. Pop-up lamp ejector. Select either 3" f/3 metal-barreled lens or 2" f/3.2 projection lens for wide angle showing in small rooms. Comes with 150 watt lamp, fan-cooled. Weighs only 5 lbs. 10" long.

Z-8520 ..... **44.50**

FILMSTRIP-SLIDE PROJECTOR

Viewlex "Little Giant"—Similar to No. Z-8520, but with 300 watt lamp, fan cooled.

Z-8521 ..... **58.50**

FILMSTRIP-SLIDE PROJECTORS

Viewlex "Little Giant", Remote Control—Same fan-cooled models as No. Z-8520, except with push-button remote control feature which enables advancement of filmstrip from anywhere in room; machines may also be operated manually. Complete with 12' cord.

Z-8527 ..... **150 watt** **79.95**

Z-8528 ..... **300 watt** **93.95**

OVERHEAD PROJECTOR

AO "Apollo 6"—This low cost overhead projector handles full 10"x10" transparencies. It is small in size, portable, compact and lightweight. AO Apollo delivers 2000 lumens to the screen. Projection distance is 5 to 13 feet. Aperture is a full 10"x10". Entire glass platen stays remarkably cool. Light-tight metal housing; fast, sharp focus; compensated tilting head (30° image elevation); handy storage compartments. Dichroic reflector filters out heat-producing infra-red rays. Quiet fan produces steady flow of cool air throughout the interior. Has built-in 8½"x11" transparency locator for horizontal and vertical positioning. Weighs only 15 pounds. Dimensions: 21¾" to top of post; 9¾" to top of platen; 12⅜" wide, 13¾" long. Comes with 600 watt, 120 volt quartz iodine lamp. With 15 ft. line cord.

Z-8160 ..... **174.50**

OVERHEAD PROJECTOR

AO "Apollo 6", Economy Model—Similar to No. Z-8160 Standard Apollo projector, except supplied without thermoswitch, transparency locator and side shelf attachment pins. Cord length is 10 ft. instead of 15 ft.

Z-8167 ..... **144.00**

OVERHEAD PROJECTOR

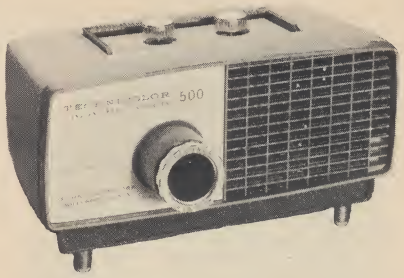
AO "Apollo 10", 1,000 watts—New 1,000 watt lamp projects 3,000 lumens to produce brightest possible image. Other features similar to Z-8160.

Z-8168 ..... **199.00**

FILMSTRIP-SLIDE PROJECTOR

Viewlex "Little Giant", 500 watts—New manually operated model features Halogen projection lamp providing 500 watts of color-true blue-white light. Forced-air blower cooling.

Z-8519 ..... **79.95**



TECHNICOLOR INSTANT MOVIE PROJECTOR

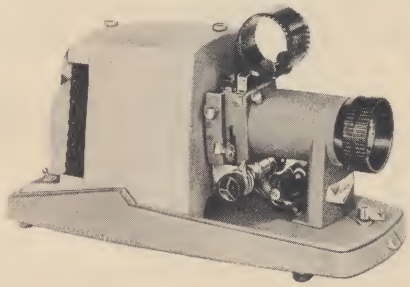
8 mm, Model 500—An extremely compact projector (no larger than a telephone) using "Magi-Cartridge" loading for fast, easy film change. No threading, no rewinding. Snap in the cartridge, turn on the switch and projection begins. Features include: Technor 20 mm f/1.6 lens; constant speed, maintenance-free motor, blower cooled; 150 watt Trueflector lamp which provides 500 watt brilliance; geared tilt control; and carrying handle. Sturdy die-cast housing is 9½x6¼ x5½" high, and weighs just 8 lbs. For use on 110-120 volts, 60 Hz. Maximum film length 50 feet, to run 4 minutes. Any Technicolor Dealer can load your processed 8 mm film into Magi-Cartridges. Exposed film can be processed and loaded at the same time.

Z-8595 ..... **79.50**

TECHNICOLOR SUPER 8 INSTANT MOVIE PROJECTOR

8 mm, Model 510A—Same as No. Z-8595 except equipped for new Super 8 film. Has 20 mm f/1.5 lens.

Z-8596 ..... **99.50**



FILMSTRIP-SLIDE PROJECTOR

Viewlex "V-500"—Accommodates 35 mm filmstrips, single or double frame, for vertical or horizontal projection. Also takes 2"x2" slides in all types of mounts. Automatic take-up accepts film and winds it neatly. "Pin-type" lamp and "pop-up" lamp ejector for easy replacement. Magnifying pointer enlarges area you wish to emphasize. Comes with 5" F/3.5 professional lens. 500 watt lamp fan-cooled for longer lamp life. Molded carrying case.

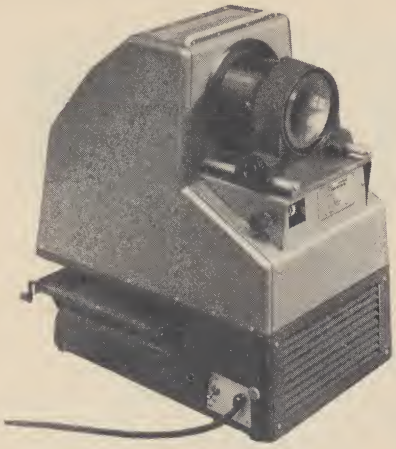
Z-8505 ..... **127.50**

FILMSTRIP-SLIDE PROJECTOR

Viewlex "V-25A" Auto-Feed Model—This projector is similar to No. Z-8505 but has added convenience of Auto-Feed for quick showing of filmstrips. It automatically threads and feeds filmstrips into your projector. For roll form or Auto-Feed cartridges. The cartridge snaps easily into the Auto-Feed unit for use. Filmstrip is quickly rewound onto the cartridge afterwards for storage.

Z-8518 ..... **108.50**

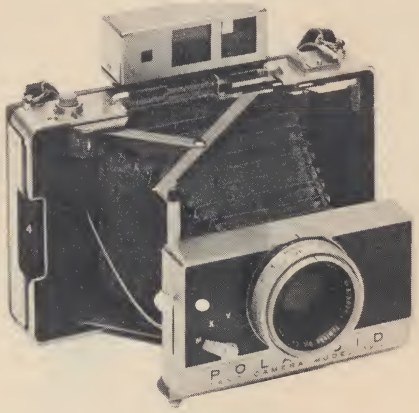
Projectors, Cameras, Screens



OPAQUE PROJECTOR

AO "Delineascope 1000"—18" focal length projection objective with 5" diameter coated (Americote) lenses and 10"x10" projection aperture. Adjustable platen movement to 2½" opening. Image is projected to 7½ ft. square at 15 ft. Smooth, positive rack and pinion focusing. Light beam pointer with fingertip control directs attention to any part of screen image. First surface mirror is universally adjustable; secondary mirrors are high reflectance, spring-mounted to prevent breakage. Sliding drawer permits instant insertion or removal of glass pressure plate, and large door permits convenient access for lamp replacement and cleaning. Constructed of cast and sheet aluminum, the exterior is finished in two-tone charcoal gray and gray stip-tone. Complete with projection objective, optical pointer, 1000 watt lamp bulb and optics capable of 145 lumens; permanently attached 15 foot, 3-wire UL, CSA approved cord. Without roll feed attachment. For operation on 115 volts, 60 Hz.

349-80 ..... **365.00**



POLAROID CAMERA

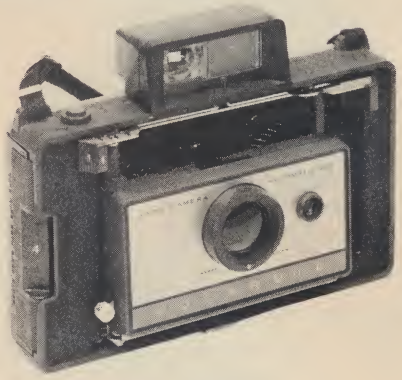
Model 180—High-quality non-electric eye camera designed for control of pictorial effects with skillful choice of lens opening and shutter speed. A superb instrument for color work, and its black and white range is almost unlimited. Produces 3¼x4¼" prints. Model 180 incorporates a 4-element color-corrected f/4.5 Tominon (Tessar type) lens. Focal length is 114 mm. A choice of apertures as small as f/90 will provide depth of field for black and white pictures from less than 2 feet to infinity. An EV number readout is built in. Precision shutter is a Seiko SLV between-the-lens type, with speeds from 1 sec. to 1/500th, bulb, and a 10-sec. timer. Zeiss Ikon rangefinder-viewfinder automatically corrects for parallax and field size. Weighs 2 lbs. 12 oz. With carrying strap and removable cover. Without flashgun.

Z-8562 ..... **189.95**

POLAROID CLOSE-UP KIT

For Use With Model 180—Lets you photograph objects as close as 9 inches, with field sizes ranging from 6x8" to 8½x11". Kit includes lens, view-focus adapter and light diffuser.

Z-8563 ..... **15.95**



POLAROID CAMERA

Model 210 Automatic—This low priced model offers the basic features of the more elaborate automatics: the same film, fast loading, electric eye operation, and 3¼ and 4¼ inch prints. Model 210 has a precision molded plastic body and shutter housing, simplified non-folding rangefinder, duplet lens, and limited accessory capability. It comes complete with a detachable protective cover and an adjustable nylon carrying strap. Without flashgun.

Z-8561 ..... **49.95**

POLAROID POLACOLOR FILM

Type 108—For all Polaroid Color Pack cameras. 75 speed. Eight 3¼x4¼" prints per pack.

Z-8572 ..... 3 Packs **15.95**

POLAROID PANCHROMATIC FILM

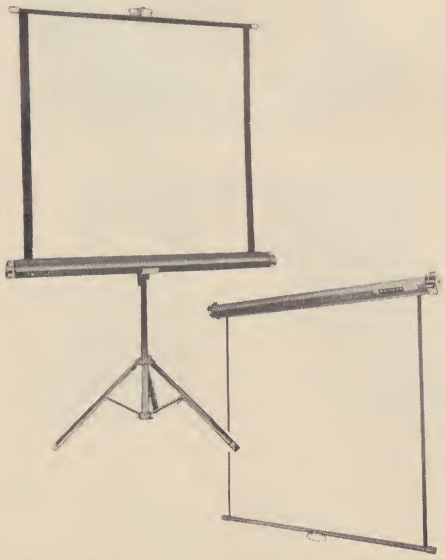
Type 107—Black and white, for all Polaroid Color Pack cameras. 3000 speed. Eight 3¼x4¼" prints per pack.

Z-8571 ..... 6 Packs **16.50**

POLAROID FILM

Type 55—4x5" Positive/Negative. 12 packets per package.

Z-8573 ..... **8.55**



KEYSTONE ELIMINATOR — Tilts tripod screens up to 16" for overhead projector use.

Z-6270 ..... **3.00**

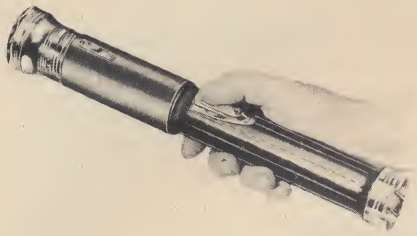
KEYSTONE BRACKETS — Adjustable 14"-26"; adapt wall screens for overhead projector use.

Z-6272 ..... per pr. **10.00**

RADIANT PROJECTION SCREENS

Cat. No.	Size, In.	Description	Each
Tripod Models			
Z-6281 (011)	50x50	**Beaded "Micro-Flect"**—Greatest overall brightness. Steel legs and regular tension hook. Add Keystone Eliminator for overhead projector use.	39.95
Z-6282 (011)	60x70		57.95
Z-6283 (011)	70x70		68.50
Z-6281 (021)	50x50	**Matte White**—Sharp image over widest angle of view. Steel legs, regular hook. Add Keystone Eliminator for overhead projector.	39.95
Z-6282 (021)	60x60		57.95
Z-6283 (021)	70x70		68.50
Z-6293	50x50	**Silver Lenticular "Optiglow"**—Best projection for partly lighted rooms. Aluminum legs; automatic case lock. Built-on Keystone Eliminator.	56.50
Z-6294	60x60		76.50
Z-6295	70x70		82.50
Wall Mount Models			
Z-6273	50x50	**Beaded "Micro-Flect"**—Greatest overall brightness. Add Keystone brackets for overhead projection use.	25.95
Z-6276	60x60		38.95
Z-6278	70x70		49.95
Z-6274	50x50	**Matte White**—Sharp image over widest angle of view. Add Keystone brackets for overhead projection use.	25.95
Z-6277	60x60		38.95
Z-6279	70x70		49.95
Z-6296	50x50	**Silver Lenticular "Optiglow"**—Best projection for partly lighted rooms. With wall brackets. Add Keystone brackets for overhead projector use.	41.00
Z-6297	60x60		51.00
Z-6298	70x70		61.00

Projection Equipment



SPOTLIGHT POINTER

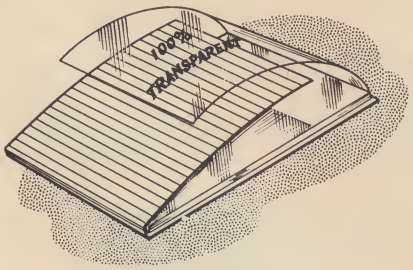
Battery Operated—For calling attention to subjects on projection screen. A sharply defined arrow is projected by the pointer.

Z-6252 ..... **18.90**

LETTERING KIT

AO Letterite Kit—Everything you need to make overhead projection graphics that look professional at minimum cost. Trace with fine line lettering pens on clear acetate sheets. Includes red, blue and black inks, also 3 pens, 3 droppers, and pen cleaner. Use ⅛ and ⅜ inch guides for letters and numerals. Metal lettering straight edge.

Z-8060 ..... **22.50**



THROW-AWAY TRANSPARENCY TABLET

100 durable transparent-film sheets in form encourage quick designing of overhead transparencies. Usable with many ball point pens and typewriter ribbons, all grease pens and felt marking pens.

Z-8061 ..... ea. **2.50**
Package of 10 ..... **24.00**

TRANSPARENCY MARKING PENS

Marsh "Project-A-Mark" — Designed for use on Overhead Projectors. Vibrant colors are easily removable with water. Marks all surfaces and dries in 30 seconds. Slant tip for Fine-Medium-Broad lines. Set of 4 includes: black, blue, red, and green. Set of 8: black, blue, yellow, orange, red, green, brown, violet.

Z-8062 ..... 4 Color Set **3.49**
Z-8063 ..... 8 Color Set **6.98**

PROJECTOR TABLES

Shelves 18"x24"—The fourteen models listed below offer heights ranging from 16 to 42 inches and may be ordered with or without such conveniences as electrical assemblies or large locked storage areas. The 42" and 34" models are most suitable for use with movie, filmstrip and slide projectors; 26" high best for use with overhead projectors, record players recorders; 16" high for use with overhead projectors. Construction features: Thick ribbed rubber mat on top; four heavy duty 4" casters (2 with lock); No. 20 gauge reinforced steel shelves and No. 14 gauge steel channel legs. Electrical assembly includes 3 wire No. 16 20' line cord with two female outlets. Locked cabinet (with two keys) is 18"x24"x28" with full length piano-type hinged door. Color-styled in baked silicone enamel.

Tables Without Electrical Assembly

Cat. No.	Ht., In.	Ship. Wt., Lbs.	Each
Z-8544	42	43	31.00
Z-8545	34	39	30.00
Z-8546	26	30	29.00
Z-8547	16	27	28.00

Tables With Storage Cabinets
(Without electrical assembly)

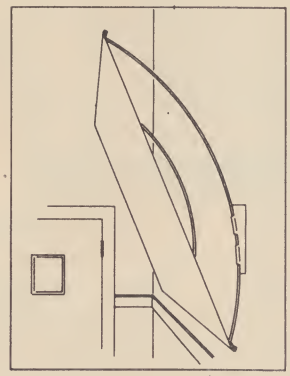
Cat. No.	Ht., In.	Ship. Wt., Lbs.	Each
Z-8554	42	58	50.00
Z-8555	34	55	49.00
Z-8556	26	46	48.00

Tables With Electrical Assembly

Cat. No.	Ht., In.	Ship. Wt., Lbs.	Each
Z-8540	42	45	36.00
Z-8541	34	41	35.00
Z-8542	26	32	34.00
Z-8543	16	29	33.00

Tables With Storage Cabinets And Electrical Assembly

Cat. No.	Ht., In.	Ship. Wt., Lbs.	Each
Z-8557	42	60	55.00
Z-8558	34	57	54.00
Z-8559	26	48	53.00

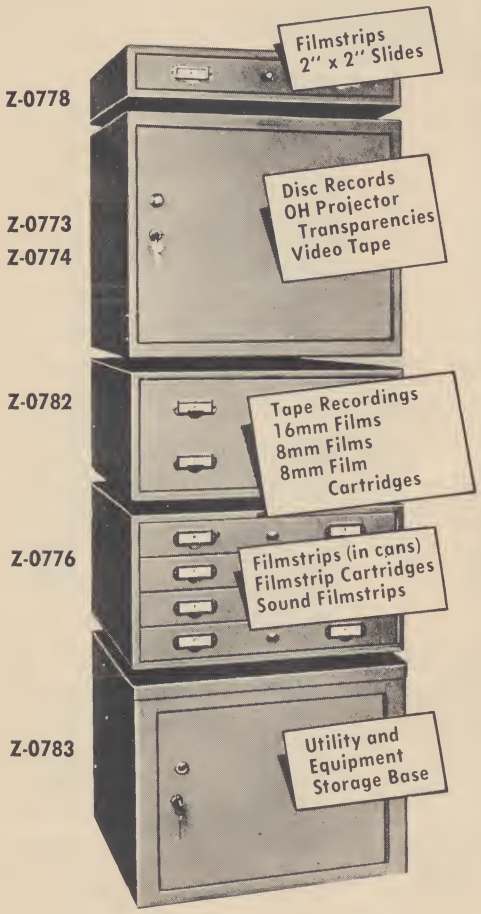


TILTING SCREENS

Technitilt—This is a lightweight screen specially designed for overhead projection use. It can be tilted in a wide arc to avoid keystoning. The screen surface is made of durable, washable vinyl, and is supported by three flexible aluminum bows which keep it flat and wrinkle free. The two outer bows are mounted in the wall brackets to permit adjustment of the tilt. To tilt the screen forward push it up; to tilt it back, pull it down.

Each Technitilt Screen is packed in a compact kit, including wall brackets and screws and a handy template to insure correct positioning.

Z-6291 ..... 48"x64" **21.95**
Z-6292 ..... 54"x72" **26.95**
Z-6291 ..... 48"x64" **21.95**
Z-6292 ..... 54"x72" **26.95**
Z-6289 ..... 60"x60" **26.95**
Z-6290 ..... 70"x70" **41.95**



AUDIO-VISUAL LIBRARY CABINETS

Lock-Stack Interchangeable Filing Systems — These units are of welded steel construction, finished in baked-on silver gray hammerloid enamel. They are designed to match and lockstack with one another (all units are 19½" W x 17½" D). Tap-out holes enable bolting them together for safety. Each unit has drawer pulls, index card holders, wire dividers, and gummed index labels for individual filmstrips. Drawers have extension arms for easy accessibility to all items. A manual, "Suggestions for Organizing and Administering a Filmstrip Library" is included.

FILMSTRIP LIBRARIES

Cat. No.	Drawers	Capacity, Filmstrips	Dim. in., H x W x D	Each
Z-0778	1	100	3¾x19½x17½	27.90
Z-0777	2	200	6x19½x17½	41.70
Z-0776	4	400	10x19½x17½	66.90

OVERHEAD TRANSPARENCY FILES

No. Z-0773 stores 160 mounted or 500 unmounted projectures and is equipped with 160 hinged swing-out envelopes. No. Z-0774, for group filing is designed to file up to nearly 400 mounted transparencies in 4 steel partitions. Both have lock and two keys.

Z-0773 ....(with hinged envelopes).... 73.30
Z-0774 .....(4 steel partitions)..... 63.10

Tape Drawer File

Files 84—5" or 60—7" recording tapes in 3 rows; also 36—one-reel 6 mm film in cans, or 30—8mm film cartridges in original boxes. Adjustable dividers and book-end holders. 9" H x 19½" W x 17½" D.

Z-0780 ..... 46.90

TAPE LIBRARY

Files two rows of 5" tapes (26 each row) on top shelf and two rows of 7" tapes (26 each row) on lower shelf. With lock and keys. 17¼" H x 19½" W x 17½" D.

Z-0781 ..... 59.70

VIDEO-TAPE CABINET

Files up to 18—6" and 6½" video tape reels 2 inches wide (a greater number if width is less). 9" H x 19½" W x 17½" D.

Z-0782 ..... 46.90

BASE CABINET

Built in storage compartment and locking door. Serves as base for other storage components listed above. Door opening 12½" H x 16¼" W. Base itself is 15" H x 19½" W x 17½" D.

Z-0783 ..... 35.20

BASE CABINET

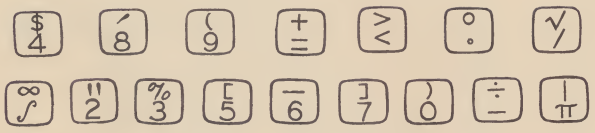
Same as above, except without storage compartment.

Z-0784 ..... 23.10

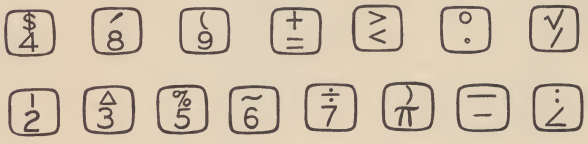
ROYAL PORTABLE MATHEMATICAL TYPEWRITERS

- **Rapid typing of Exams, Homework Assignments, Lesson Plans, Curriculum Papers.**
- **Eliminate Laborious Hand Sketching of Symbols.**
- **Full 88 Character Keyboards Feature Special Mathematical Symbols.**

Manual



Electric



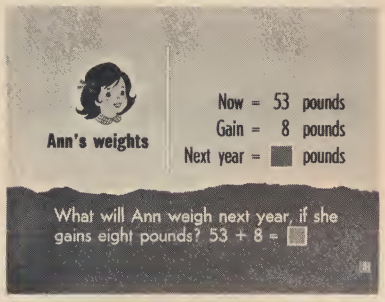
ROYAL SAFARI® PORTABLE TYPEWRITER — 44 keys include 16 (32 Math symbols) shown above, plus 28 covering the alphabet and punctuation marks. Special features include: Magic® column clear; Twin-pack ribbon and color selector; Automatic ribbon reverse; Cylinder scale; Variable line spacer; Magic® meter; Erasure table; Steel frame and rib cage; Carrying case. Weighs 17 lb. 14 oz. Pottery Blue Finish. Pica-size type.

Z-8501 ..... 119.75

ROYAL ULTRONIC™ ELECTRIC TYPEWRITER — This rugged portable's 42 keys include the 15 (30 Math symbols) shown above plus 27 keys covering the alphabet and punctuation marks. **Special fully electric features:** Carriage return; Repeat space bar; Tabulator; Shift; Ribbon feed; Back spacer. In addition, this machine offers 11¾" paper capacity; 1, 1½, 2 line Spacing; Line finder for typing exponents and subscripts; Magic® margins; Detachable power cord. Weighs 25 lbs. 3 oz. Color: White. Pica-size type.

Z-8503 ..... 210.50

SVE Filmstrips



Z-8460

USING MODERN MATHEMATICS—Group 1-1 — Develops concepts of using and understanding numbers one to twelve, recognizing sets, associating numerals and names with objects.

Sets 1-5 (58 frames)
Sets 5-9 (63 frames)
Sets 9-12 (51 frames)
Telling Time (51 frames)
Pennies, Nickels, Dimes, Quarters (44 fr.)

Set of 5 Captioned Filmstrips (total 267 frames) is SVE Set 531-SA

Z-8457 ..... Per Set **27.00**

USING MODERN MATHEMATICS—Group 1-2 — Teaches concepts for sets 11 to 20. Simple addition and simple subtraction with concrete objects. Compares numbers by size, order, and position.

Sets 11-15 (47 frames)
Sets 16-20 (48 frames)
Sets by 1's, 2's 5's, 10's (48 frames)
Addition—Objects and Symbols (44 frames)
Subtraction—Objects and Symbols (48 fr.)
Simple Measures (47 frames)

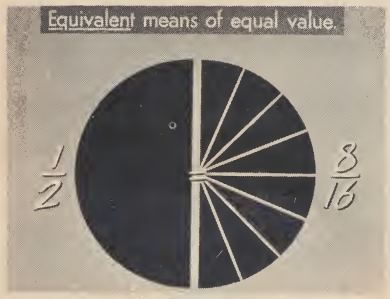
Set of 6 Captioned Filmstrips (total 282 frames) is SVE Set 531-SB

Z-8458 ..... Per Set **33.00**

ELEMENTARY MATHEMATICS FILMSTRIP SET — This instructive set of 6 color filmstrips contains the 138 color charts from the outstanding reference book "Mathematics Background For The Primary Teachers", by Ella L. Merton and Lola J. May. The topics covered by each filmstrip, as detailed below, indicate their correlation to the eighteen chapter book.

Filmstrip 1: What to Expect in Elementary Math; Sets
Filmstrip 2: Number and Numeral; Equalities and Inequalities; Number Sequence; Inverse Operations; Number
Filmstrip 3: Commutative Properties; Associative Properties; Distributive Property of Multiplication over Addition; Identity Properties; Zero Property of Multiplication
Filmstrip 4: Number Lines; Story Problems
Filmstrip 5: Expanded Notation; New Format for Division
Filmstrip 6: Geometry; Patterns

Z-8776 ..... Per Set with Book **20.00**



Z-8465

USING MODERN MATHEMATICS—Group 2

Sets by 2's, 3's, 4's, and 5's (43 frames)
Simple Addition Advanced (57 frames)
Simple Subtraction Advanced (56 frames)
Multiplication — Objects and Symbols (39 frames)
Division—Objects and Symbols (40 frames)
Time Measurement—Calendar (50 frames)

Set of 6 Captioned Filmstrips (total 285 frames) is SVE Set 531-SC

Z-8459 ..... Per Set **33.00**

USING MODERN MATHEMATICS (Color)—Grade 3 — New! Latest teaching techniques in colorful charts, diagrams, and illustrations. Uses number pairs, sets, strips, lines, and open sentences.

Understanding the Structure of Numbers (40 frames)
Using and Understanding 2- and 3-Place Numbers (43 frames)
Measures: Counting, Adding, and Subtracting (44 frames)
The Calendar, Time, and Temperature (43 frames)
Addition and Subtraction: 2- and 3-Place Numbers (43 frames)
New Phases of Addition and Subtraction (54 frames)
Multiplying and Dividing (53 frames)
Advancing with Addition, Subtraction, Multiplication, and Division (53 frames)

Set of 8 Captioned Filmstrips (total 373 frames) is SVE Set 537-SD

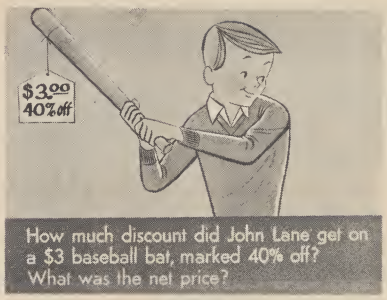
Z-8460 ..... Per Set **44.50**

USING MODERN MATHEMATICS (Color)—Grade 4 — Intermediate level; develops understanding of sets. Teaches Commutative and Associative principles. Introduces rays, angles, closed and open curves and figures, geometric shapes.

Sets—Concepts, Symbols, Operations (47 frames)
Multiplication Facts—Sets (53 frames)
Division Facts—Sets (46 frames)
Geometry—Sets, Rays, Angles, Figures (62 frames)
Fractions (56 frames)
Number Line—Whole Numbers (46 frames)
Number Line—Fractions (45 frames)
Numeration: Base 10 (52 frames)

Set of 8 Captioned Filmstrips (total 407 frames) is SVE Set 532-SA

Z-8461 ..... Per Set **44.50**



Z-8468

USING MODERN MATHEMATICS—Group 5 — Enrichment and understanding are provided through the use of number lines, and open and closed sentences. For easy step-by-step learning.

Advancing in Geometry (50 frames)
Geometry (58 frames)
Graphs (47 frames)
Fraction Numerals: Concepts (49 frames)
Addition & Subtraction of Fractions (49 frames)
Multiplication of Fractions (49 frames)
Using Measures (49 frames)
Numeration: Base five (49 frames)

Set of 8 Captioned Filmstrips (total 400 frames) is SVE Set 532-SB

Z-8482 ..... Per Set **44.50**

USING MODERN MATHEMATICS—Group 6 — New set of eight filmstrips continues the development of basic principles of modern mathematics. Teacher-planned illustrations provide meaningful visual experiences, aid understanding of abstract concepts.

Division of Fractional Numbers (50 frames)
Geometry—Lines, Angles, Arcs, Measures (51 frames)
Geometry—Perimeters, Areas, Formulas (53 frames)
Space Geometry—Surfaces & Volumes of Space Figures (50 frames)
Numeration—Base six (51 frames)
Base Six—Addition, Subtraction, Multiplication, Division (49 frames)
Numeration—Binary (Base two) (52 frames)
Binary (Base two)—Addition, Subtraction, Multiplication, Division (50 frames)

Set of 8 Captioned Filmstrips (total 406 frames) is SVE Set 532-SC

Z-8483 ..... Per Set **44.50**

MATH LIBRARY — Primary—Intermediate Using Modern Mathematics—Groups 1-1, 6, Consisting of sets Nos. Z-8457, Z-8458, Z-8459, Z-8460, Z-8461, Z-8462, and Z-8483.

This is SVE Set 531-SS

Z-8484 ..... **271.00**

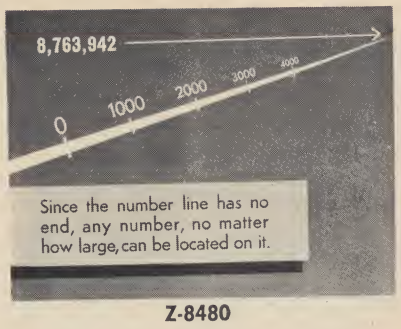
UNDERSTANDING FRACTIONS (Color)—Grades 4-6

The Origin and Meaning of Fractions (43 frames)
Uses of Fractions (38 frames)
Language of Fractions (53 frames)
Different Names for the Same Fractional Number (46 frames)
Addition of Fractions (45 frames)
Subtraction of Fractions (39 frames)
Multiplication of Fractions (42 frames)
Division of Fractions (47 frames)

Set of 8 Captioned Filmstrips (total 353 frames) is SVE Set 530-S

Z-8465 ..... Per Set **43.20**

SVE Filmstrips



Z-8480

DECIMALS AND MEASUREMENTS (Color) —Grades 5-7

Meaning and Reading of Decimals (43 fr.)
Addition and Subtraction of Decimals (50 fr.)
Multiplication of Decimals (50 frames)
Division of Decimals (57 frames)
Fractions to Decimals—Decimals to Fractions (54 frames)
Advancing in Linear Measurements (45 fr.)
Advancing in Quantity Measurements (54 frames)

Set of 7 Captioned Filmstrips (total 353 frames) is SVE Set 538-S

Z-8467 ..... Per Set **34.65**

PER CENTS AND PERCENTAGES (Color) —Grades 7-8

Meaning and Understanding of Per Cent; Percentages (41 frames)
Buying and Selling—Applications of Per Cent (46 frames)
Commission—Meaning and Application (48 frames)
Interest—Borrowing and Investing (59 fr.)
Insurance (57 frames)
State and Local Taxes (52 frames)
Federal Taxes (47 frames)

Set of 7 Captioned Filmstrips (total 350 frames) is SVE Set 539-S

Z-8468 ..... Per Set **37.80**

ADDITION COMBINATIONS — Primary —Inter. — Black and white filmstrips: 15 easiest combinations; 19 zero combinations; 36 others; with Teacher's Guide. (approx. 50 frames each filmstrip)

Set of 4 Filmstrips (total 200 frames) is SVE 536-SB

Z-8470 ..... Per Set **8.00**

SUBTRACTION COMBINATIONS — Primary—Inter. — 15 easiest, 30 easy, 19 zero combinations, 36 others; with Teacher's Guide (50 frames each filmstrip)

Set of 4 Filmstrips (total 200 frames) is SVE 536-SC

Z-8471 ..... Per Set **8.00**

MULTIPLICATION COMBINATIONS—Primary—Intermediate — 100 combinations; with Teacher's Guide. (50 fr. per filmstrip)

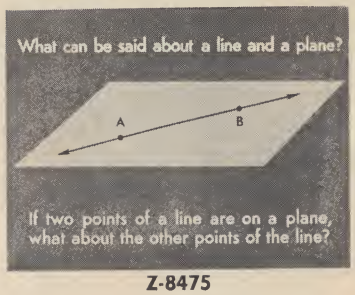
Set of 4 Filmstrips (total 200 frames) is SVE 536-SD

Z-8472 ..... Per Set **8.00**

DIVISION COMBINATIONS — Primary—Inter. — 90 combinations; with Teacher's Guide. (50 fr. per filmstrip)

Set of 4 Filmstrips (total 200 frames) is SVE 536-SE

Z-8473 ..... Per Set **8.00**



Z-8475

ARITHMETIC COMBINATIONS

The Complete Series 16 Filmstrips included in Nos. Z-8470, Z-8471, Z-8472, Z-8473. This is SVE Set 536-SF

Z-8486 ..... Per Set **28.80**

MODERN ELEMENTARY ALGEBRA — Group 1 Grades 8-10 — Emphasizes the structure of the number system as a basis for clear reasoning above elementary algebra.

Language of Sets (50 frames)
Open Sentences (50 frames)
Introduction to the Number Line (47 fr.)
Negative Numbers (50 frames)
Closure; Commutative and Associative Properties (50 frames)

Set of 5 Filmstrips (total 247 frames) is SVE Set 557-SA

Z-8480 ..... Per Set **27.00**

MODERN ELEMENTARY ALGEBRA (Color) Group 2 Grades 8-10

The Distributive Property (40 frames)
Identity and Inverse Properties (55 fr.)
Subtraction and Division (57 frames)
Order Properties (51 frames)
Equivalent Open Sentences (62 frames)

Set of 5 Filmstrips (total 265 frames) is SVE Set 557-SB

Z-8481 ..... Per Set **27.00**

MODERN ELEMENTARY ALGEBRA — Groups 1 and 2 — **The Complete Series of 10 Captioned Filmstrips included in: Z-8480, Z-8481. This is SVE Set 557-S**

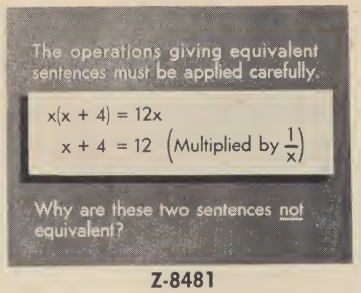
Z-8487 ..... Per Set **49.75**

MODERN ELEMENTARY GEOMETRY (Color) Grades 8-10 Group 1 — A 33⅓ rpm record for teacher's use prefaces this set.

Distance and Betweenness (55 frames)
Points, Lines and Planes (58 frames)
Angles (63 frames)
Congruence (60 frames)
Proof (65 frames)
Parallelism (55 frames)

Record and Set of 6 Filmstrips (total 356 frames) is SVE Set 542-SA

Z-8475 ..... Per Set **33.00**



Z-8481

MODERN ELEMENTARY GEOMETRY (Color) Grades 8-10 Group 2

Polygons (53 frames)
Areas of Polygonal Regions (56 frames)
Coordinate Geometry (58 frames)
Circles and Spheres (64 frames)
Arcs and Areas of Circles (57 frames)
Volumes of Solids (62 frames)

Set of 6 Captioned Filmstrips (total 350 frames) is SVE Set 542-SB

Z-8476 ..... Per Set **33.00**

MODERN ELEMENTARY GEOMETRY —Groups 1 and 2 — **(A Series of 12 Captioned Filmstrips as described above: Z-8475, Z-8476. This is SVE Set 542-S**

Z-8478 ..... Per Set **59.50**

DISCOVERING SOLIDS (Color, with Records)—Jr.-Sr. High — Comes with two back-to-back 33⅓ rpm records and teacher's guide.

Volumes of Cubes, Prisms and Cylinders (98 frames, 15 minutes)
Volumes of Pyramids, Cones and Spheres (91 frames, 15 minutes)
Surface Areas of Solids 1 (62 frames, 15 minutes)
Surface Areas of Solids 2 (60 frames, 15 minutes)

Set of 4 Captioned Filmstrips (total 311 frames) with 2 recordings, is SVE Set R414-SR

Z-8469 ..... Per Set **27.00**

MATH LIBRARY—Jr.-Sr. High

Modern Algebra Groups 1 and 2; Modern Geometry Groups 1 and 2—The Complete Series of 22 Captioned Filmstrips included in the preceding sets: Z-8480, Z-8481, Z-8475, Z-8476. This is SVE Set "M"

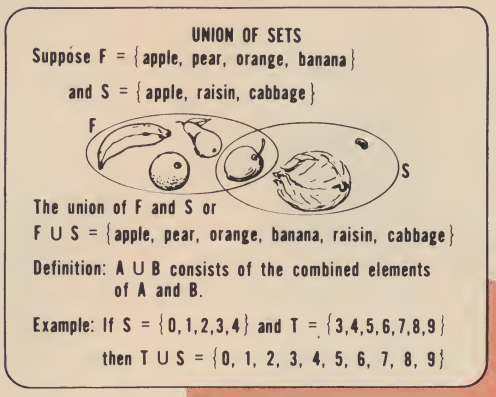
Z-8485 ..... Per Set **109.25**

MEASUREMENTS ARE FOR A PURPOSE (Color)—Jr.-Sr. High — As it traces the history of measurements and the establishments of standards, this filmstrip set discusses the development and need for complex measurement instrumentation standards.

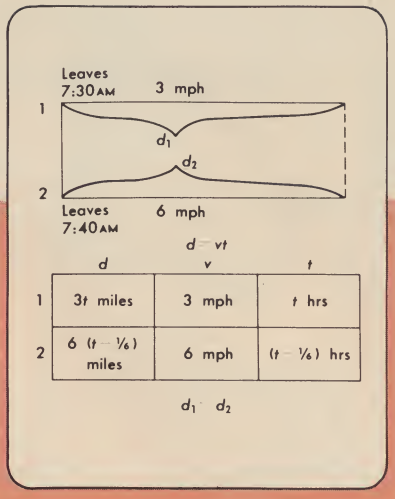
Standards and Measurements (54 frames, 14 minutes)
Measurement Systems and Theory (52 frames, 14 minutes)

Set of 2 Filmstrips (total 106 frames) with Record, is SVE Set 562-SR

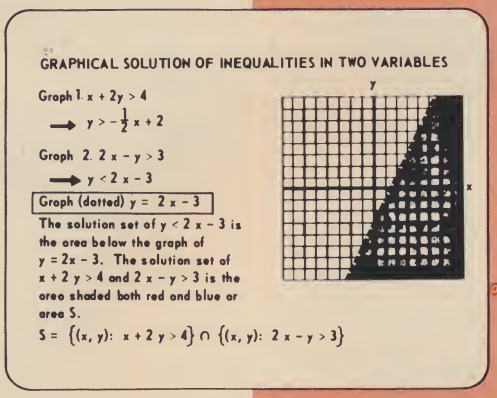
Z-8488 ..... Per Set **17.00**



Z-7023 (003)
JR. HIGH MATHEMATICS
See Page 68



Z-8693 (010)
1st YEAR ALGEBRA
See Page 66



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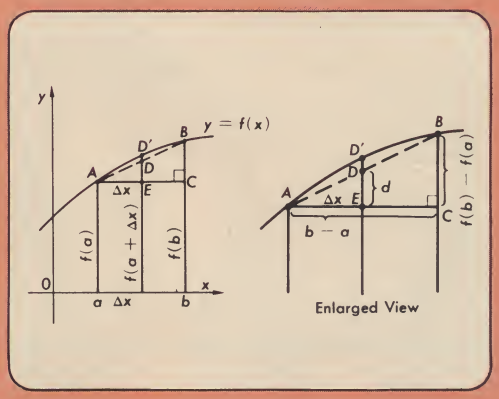
1st YEAR ALGEBRA
See Page 69



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MATHEMATICS
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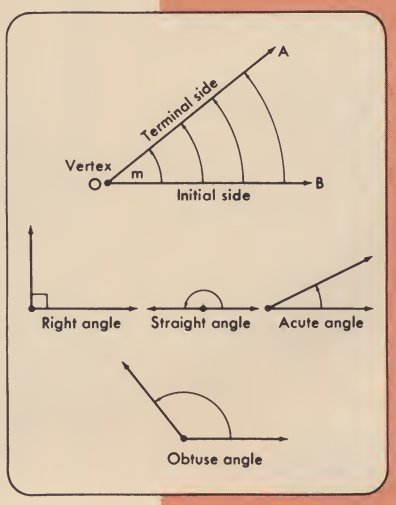

Z-8694 (001)
UNIFIED GEOMETRY
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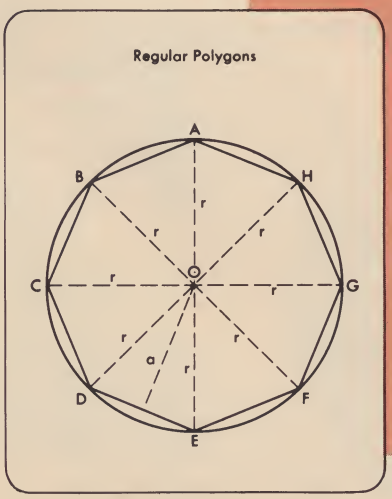

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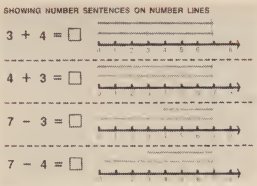

(001) What to expect in elem. math. (1)
(002) What to expect in elem. math. (2)
(003) Sets
(004) Kinds of sets
(005) Sets—one-to-one correspondence
(006) Sets—non-equivalent sets
(007) Sets—many-to-one, and one-to-many
(008) Extending defined sets
(009) Sets—discarding an unrelated member
(010) Cardinal numbers
(011) Sets and subsets
(012) Subsets
(013) Equal sets
(014) Equivalent sets
(015) Union of sets
(016) Union of sets—finding missing sets
(017) Relation of sets to addition
(018) Difference between sets
(019) Relation of sets to subtraction
(020) Difference between sets
(021) Relation of sets to subtraction
(022) Intersection of sets—(intersection of streets)
(023) Intersection of sets
(024) Venn diagrams show operations on sets
(025) Finite sets
(026) Infinite sets
(027) Set terminology
(028) Sign language of sets
(029) Number and numeral
(030) Different numerals name same number
(031) Number and numeral
(032) Naming numerals for a number
(033) Equalities and inequalities
(034) Equalities and inequalities signs
(035) Equalities and inequalities exercises
(036) Number sequence
(037) Number sequence—types of exercises
(038) Subtraction is the inverse of addition
(039) Division is the inverse of multiplication
(040) Number sentences
(041) Addend-addend-sum relationship
(042) Addition number sentences
(043) Subtraction number sentences
(044) Number sentences—addition patterns
(045) Number sentences—subtraction patterns
(046) Number sentences help to name numerals
(047) Number sentences help to name numerals
(048) Number sentences help to name numerals
(049) Number sentences help to name numerals
(050) Two ways to show the factor—factor product relationship
(051) Multiplication number sentences
(052) Division number sentences
(053) Number sentences—multiplication patterns
(054) Number sentences—division patterns
(055) Commutative property of addition
(056) Commutative property of addition
(057) When does the commutative property of addition help us?
(058) Arrays help us to explain the commutative property of multiplication
(059) Using array patterns to learn the commutative property of multiplication
(060) Associative property of addition
(061) Associative property of addition—manipulating disks
(062) Using the associative property of addition to group to make a ten
(063) How can the associative property of addition help us?
(064) How to use both the associative property of addition and the commutative property of addition
(065) Using the associative property of addition to discover new addition facts
(066) Associative property of multiplication
(067) Distributive property of multiplication over addition
(068) Manipulation helps to understand the distributive property of multiplication over addition
(069) The steps in applying the distributive property of multiplication over addition
(070) How does the distributive property of multiplication over addition help us?
(071) Using the distributive property of multiplication
(072) How does the distributive property of multiplication over addition help us?
(073) Identify property of zero in addition
(074) Identity property of one in multiplication
(075) The zero property of multiplication
(076) Number lines—introduction
(077) Direction on a number line
(078) Showing number sentences on number lines
(079) Showing number comparisons on number lines
(080) Showing number sentences on number lines
(081) Other uses of a number line
(082) Addition of fractions on a number line
(083) Subtraction of fractions on a number line
(084) A closed circular number line—(a clock face)
(085) A thermometer is a vertical number line
(086) Number sentences solve pictured problems
(087) Number sentences solve rebus addition problems
(088) Number sentences solve rebus subtraction problems
(089) Addition—introducing the verbal addition story problem
(090) Subtraction—introducing the verbal subtraction story problem
(091) Story problems—how many more are needed?
(092) Story problems—finding the missing part of a set
(093) Story problems—comparing to find the difference between two sets
(094) Multiplication story problems
(095) Division story problems
(096) Place value in arithmetic—the numerals of arithmetic
(097) Expanded notation
(098) Comparing arithmetic with expanded notation
(099) Overloading in traditional arithmetic—when is regrouping necessary?
(100) Overloading in expanded notation—when is regrouping necessary?
(101) Adding with expanded notation
(102) Expanded notation with three-place addends
(103) Subtracting with expanded notation
(104) Expanded notation when there are not enough from which to subtract
(105) Multiplying with expanded notation
(106) Expanded notation with difficult multiplication examples
(107) A new format for division
(108) The new division format—even and uneven division, using method A
(109) The new division format—even and uneven division, using method B
(110) Using the new division format
(111) The new division format—dividing by two-place numbers
(112) Teaching the properties of geometric shapes
(113) Comparison of size of geometric shapes
(114) Geometry—importance of shape and size
(115) Set language used in geometry
(116) Point versus dot similar to number versus numeral
(117) How to use a straightedge correctly
(118) Connecting dots to make shapes
(119) Many points make a line
(120) Line segment: A piece of a line
(121) Paths: Curved or straight
(122) What are simple closed curves?
(123) What is a circle?
(124) What is a ray?
(125) Angles need rays
(126) Planes are flat
(127) Some simple closed curves are polygons
(128) Relationship of points, lines, and planes
(129) Checking on the symbols of geometry
(130) Checking on more geometric symbols
(131) Finding number patterns on an addition table
(132) Finding number patterns on a multiplication table
(133) Finding number patterns on the hundred chart
(134) Using square patterns to provide varied practice
(135) Patterns in which we add in every direction
(136) Patterns with odd and even numbers
(137) Finding number patterns and finding rules
(138) Numbers have shapes that form patterns
(139) Number patterns—a nomograph is a number graph

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(002)	Venn Diagram—Operations of Intersection
(003)	Venn Diagram—Rational Numbers
(004)	Number Lines
(005)	Solutions Sets—Equalities and Inequalities
(006)	Solutions Sets—Example
(007)	Solutions Sets—Example
(008)	Motion Problem—$V = \frac{d}{t}$ or $= vt$
(009)	Motion Problem—Objects Meeting
(010)	Motion Problem—Faster Object Overtaking
(011)	Mixture Problem
(012)	Relation Problem
(013)	Relation Problem
(014)	Coordinate System
(015)	Slope of a Line
(016)	Coordinate Graph—$x + y = 5$
(017)	Coordinate Graph—$x + y > 5$
(018)	Coordinate Graph—$x + y < 5$
(019)	Inequality In Two Variables. (a)
(020)	Inequality In Two Variables. (b)
(021)	Direct Variation—$y = kx$
(022)	Inverse Variation
(023)	Power Variation
(024)	Linear Equations—First of a Series of Four Diagrams. (1)
(025)	A System of Simultaneous Equations (2)
(026)	Inconsistent Equations (3)
(027)	Dependent Equations (4)
(028)	Statistical Graph—Circle Graph
(029)	Statistical Graph—Frequency Polygon
(030)	Perfect Square Trinomial
(031)	Real Numbers
(032)	Quadratic Equation
(033)	Quadratic Equation—Parabolic Reflector
(034)	Trigonometry—Angle in Standard Position
(035)	Trigonometry—Unit Circle
(036)	Trigonometry—Acute Angles, a Right Triangle
(037)	Trigonometric Functions From 0° to 90°
(038)	Complex Numbers—The Complex Plane
(039)	Complex Numbers—A Quadratic Function
(040)	Graph

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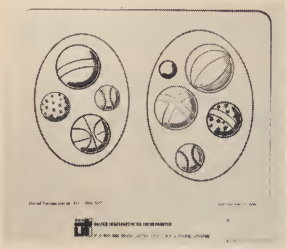
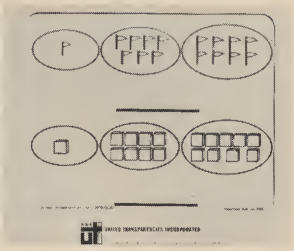


Elementary Primary Modern Mathematics



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Unit I—SETS

Set identification
Set relations
Equivalent sets—one element
Equivalent sets—two elements
Equivalent sets—three elements
Equivalent sets with more than two sets
Nonequivalent sets (1)
Nonequivalent sets (2)

Z-7002 ..... 15.60

Unit II—NUMERATION

Number and numeral identification one
Number and numeral identification two
Number and numeral identification three
Number and numeral identification four
Number and numeral identification five
Review identification one—five
Number and numeral identification six
Number and numeral identification seven
Number and numeral identification eight
Number and numeral identification nine
Review identification six—nine

Z-7003 ..... 21.45

Unit III—NUMBER COMBINATIONS

Number recognition one—four
Number recognition five—six
Number recognition seven—eight
Number recognition eight—nine
Union concept (1)
Union concept (2)
Union concept (3)
Addition concept for three
Addition concept for four

UNIT III (Cont.)

Addition concept for five
Addition concept for six and seven
Addition concept for eight and nine
Addition concept for four (2)
Addition concept for five, six, seven, eight and nine (2)
Addition concept for six (3)
Addition concept for seven, eight and nine (3)

Z-7004 ..... 31.20

Unit IV—COMMUTATIVE PROPERTY

Commutative property and addition facts for two
Commutative property and addition facts for three
Commutative property and addition facts for four
Commutative property and addition facts for five
Commutative property and addition facts for six
Commutative property and addition facts for seven
Commutative property and addition facts for eight
Commutative property and addition facts for nine

Z-7005 ..... 15.60

Unit V—INEQUALITIES

One more than one
One more than two
One more than two—overlay
One more than three
One more than three—overlay
One more than four
One more than four—overlay
One more than five

UNIT V (Cont.)

Five more than one
One more than six
One more than seven
One more than eight
One less than two
One less than two—overlay
One less than three
One less than three—overlay
One less than four
One less than four—overlay
One less than five
One less than five—overlay
One less than six
One less than seven
One less than eight
One less than nine
One less than one
Number comparison zero—nine
Comparison review

Z-7006 ..... 46.35

Unit VI—INVERSE

Addition-subtraction inverse (1)
Addition-subtraction inverse (2)
Addition-subtraction inverse (3)
Addition-subtraction inverse (4)
Addition-subtraction inverse (5)

Z-7007 ..... 9.75

Unit VII—ORDINALS

Ordinal first-third
Ordinal first-ninth
Ordinal review

Z-7008 ..... 6.05

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Fractions — Order Set of 43 Multi-Overlay Multicolor Transparencies (No. Z-0723 ..... Only $250.00)

Unit 1—MEANING OF FRACTIONS

Part of a whole—1/2 (triangle)
Part of a whole—1/4, 2/4, 3/4 (circle)
Part of a whole—2/3 (rectangle)
Part of a whole; and equivalence—2/6 = 1/3
Part of a whole—5/8 (rectangle)
Part of a whole; and equivalence—2/4 = 1/2
Comparing unlike fractions
Equivalence chart—(1, 1/2, 1/4, 1/8, 1/16)
Equivalence chart—(1, 1/3, 1/6, 1/12)
Unit fractions of a group
Changing fractions to lowest terms
Equivalent fractions—(4/6 = 2/3)
Equivalent fractions—(6/8 = 3/4)
Equivalent fractions—(8/12 = 2/3)
Changing to lower terms—rule
Changing to higher terms—rule
Proper fractions
Improper fractions
Mixed numbers
Changing improper fractions to whole

Unit II—ADDING FRACTIONS

Adding like fractions
Changing answer to lowest terms
Adding multiple like fractions
Adding an improper and a proper fraction

Unit III—SUBTRACTING FRACTIONS

Subtracting a fraction from one
Subtracting like fractions
Subtracting unlike fractions
Subtracting mixed numbers
Subtracting mixed numbers—with regrouping

Unit IV—MULTIPLYING FRACTIONS

Multiplying fraction and whole number
Commutative law of multiplication
Finding part of a part
Multiplying whole number and a fraction
Multiplying multiple fractions
Multiplying fraction and whole number
Multiplying whole and mixed numbers

Unit V—DIVIDING FRACTIONS

Dividing whole number by unit fraction
Unit fraction by a whole number
Dividing a fraction by a fraction
Whole number by a multiple fraction
Mixed number by a unit fraction
Whole number by a mixed number

Unit VI—FACTORS AND PRIMES

Sieve of Eratosthenes—prime numbers remain in the clear squares.

I. **First overlay** blocks out numbers from 1 to 100 factorable by 2; 2 omitted.
II. **Second overlay** blocks out numbers factorable by 3; 3 omitted.
III. **Third overlay** blocks out numbers factorable by 5; 5 omitted.
IV. **Fourth overlay** blocks out numbers factorable by 7, 7 itself not included. In steps 2, 3 and 4, some of the factorable numbers have already been blocked out by the previous factoring.

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Unit nos. and prices follow each grouping of titles.

Unit I—SETS
(001) Sets and Symbols
(002) Subsets
(003) Union of Sets
(004) Intersection of Sets
(005) Special Sets
(006) Set Notations
(007) One—One Correspondence
(008) Cardinal Numbers of Sets
(009) Cartesian Product of 2 Sets
Z-7011 Set of 9 Transparencies **42.75**
Z-7031 Companion Question Set **18.00**

Unit II—NUMERATION
(010) Numerals
(011) Basic Numerals*
(012) Counting
(013) Place Value
(014) Bases
(015) Place Value Notation
Z-7012 Set of 6 Transparencies **28.50**
Z-7032 Companion Question Set **10.00**
*Not covered by a "Question" transparency.

Unit III—WHOLE NUMBERS
(016) Whole Numbers
(017) Adding Whole Numbers
(018) The Commutative Property of Addition
(019) The Associative Property of Addition
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Z-7033 Companion Question Set **8.00**

Unit IV—BASE FIVE
(020) Base Five (Review)
(021) Base Five—Addition Table
(022) Addition Base Five
(023) Regrouping in Base Five
(024) Regrouping in Base Five—Addition
(025) Subtraction in Base Five
Z-7014 Set of 6 Transparencies **28.50**
Z-7034 Companion Question Set **12.00**

Unit V—MULTIPLICATION
(026) Multiplication (Definition 1)
(027) The Commutative Property of Multiplication
(028) Multiplication (Definition 2)
(029) The Distributive Property of Multiplication over Addition
(030) The Associative Property of Multiplication
(031) Base Five Multiplication
(032) Multiplication in Base Five
(033) Regrouping in Base Five—Multiplication
(034) Division in Base Five
Z-7015 Set of 9 Transparencies **42.75**
Z-7035 Companion Question Set **18.00**

Unit VI—WHOLE NUMBER SYSTEM
(035) Properties of A Mathematical System
(036) Properties of Relations in ω
(037) Properties of Addition in ω
(038) Properties of Multiplication in ω
(039) Special Properties of 0 and 1
Z-7016 Set of 5 Transparencies **23.75**
Z-7036 Companion Question Set **10.00**

Unit VII—FACTORING AND PRIMES
(040) Factors in ω
(041) Multiples of Primes in ω
(042) Spotting Primes (Sieve of Eratosthenes)
(043) Prime Factors
(044) Factoring Procedure
(045) Factors of Whole Numbers
(046) Highest Common Factor (Greatest Common Divisor)
(047) Least Common Multiple
(048) Division
Z-7017 Set of 9 Transparencies **42.75**
Z-7037 Companion Question Set **18.00**

Unit VIII—RATIONAL NUMBER SYSTEM
(049) Fractions
(050) The System $\mathfrak{J}$ of Rational Numbers
(051) Multiplication in $\mathfrak{J}$
(052) Multiplication in $\mathfrak{J}$ (Special)
(053) Multiplication (Geometry)
(054) Division in $\mathfrak{J}$
(055) Primes and Equal Fractions
(056) Addition in $\mathfrak{J}$
(057) Subtraction
Z-7018 Set of 9 Transparencies **42.75**
Z-7038 Companion Question Set **18.00**

Unit IX—GEOMETRY
(058) Set of Points
(059) Rays and Lines
(060) Angles
(061) Triangle and Plane
(062) Parallel and Skew Lines
(063) Polygons
(064) Separation
(065) Simple Closed Curves
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Unit X—NUMBER LINE
(066) Building a Number Line
(067) Addition and Subtraction on the Number Line
(068) Multiplication on the Number Line
(069) Subdividing Line Segments
(070) Rational Numbers and the Number Line
Z-7020 Set of 5 Transparencies **23.75**
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Unit XI—DECIMAL NOTATION
(071) Decimal Fractions
(072) Decimal Place Value
(073) Decimal Addition and Subtraction
(074) "Carrying" and "Borrowing"
(075) Decimal Multiplication and Division
(076) Repeating Decimals
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Unit XII—RATIOS, PERCENTS
(077) Ratio and Proportion
(078) Proportion in Geometry
(079) The Meaning of Percent
(080) Problems in Percent
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(005)	Linear Functions—Distance Formula
(006)	Conic Sections—(Ellipse and Circle)
(007)	Conic Sections—Parabola and Hyperbola
(008)	Parabola
(009)	Circle
(010)	Ellipse
(011)	Hyperbola
(012)	Quadratic Inequalities
(013)	Quadratic Inequalities
(014)	Three Dimensional Coordinate System
(015)	Equation of a Circle
(016)	Linear Equations
(017)	Second Degree—System of an Ellipse and a Parabola
(018)	Exponential Function
(019)	Logarithmic Functions
(020)	Logarithms of Numbers
(021)	Interpolation
(022)	Special Angles
(023)	Radian Measure
(024)	Graph of the Equation $y = \sin x$.
(025)	Graph of the Equation $y = \cos x$.
(026)	Graph of the Equation $y = \tan x$.
(027)	Graph of the Equation $y = 2 \sin x$.
(028)	Graph of the Equation $y = \sin 2x$.
(029)	Law of Sines and Cosines
(030)	$y = \arcsin x$ and $y = \arccos x$
(031)	Line Tangent to a Circle
(032)	Addition and Subtraction of Complex Numbers
(033)	Trigometric Form of Complex Numbers
(034)	Sum of Two Vectors
(035)	Components of a Given Vector
(036)	Application of Vectors Two or More Forces
(037)	Vectors—Two or More Forces Acting Upon an Object
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(003) Subsets
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(021) Opposites
(022) Absolute Value
(023) Adding Directed Numbers
(024) Additive Inverse
(025) Definition of Subtraction
(026) Definition of Multiplication
(027) Multiplicative Inverse
(028) Division
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(030) Equations
(031) Addition Property of Equality
(032) Multiplication Property of Equality
(033) Using the Equation Transformation Principle
(034) Inequalities
(035) Addition Property of Inequality
(036) Multiplication Property of Inequality (Positive Numbers)
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(039) Absolute Value and Sentences

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(043) Multiplying with the Same Base
(044) Division of Powers
(045) Power of a Power
(046) Exponent Zero
(047) Negative Exponents
(048) Powers of Products and Quotients
(049) Addition of Polynomials
(050) Multiplication of Polynomials
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(058) Multiplication of Rational Algebraic Expressions
(059) Division of Rational Algebraic Expressions
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(061) Three Signs of an Algebraic Expression

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(065) Repeating Decimals
(066) Irrational Numbers
(067) Properties of Square Roots
(068) Extending the Number Line to Include Irrational Numbers
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(072) The Rectangular Coordinate System
(073) Solution Set of an Open Sentence In Two Variables
(074) Graph of a Linear Equation in Two Variables
(075) Slope of the Graph of an Equation
(076) Slope Intercept Form
(077) Graphs of Open Sentences in Two Variables
(078) Graphical Solution of Linear Equations in Two Variables
(079) Graphical Solution of Inequalities in Two Variables
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(006)	Linear Functions—Slope
(007)	Tangent to a Curve
(008)	Tangent Line Parallel to x -axis
(009)	Linear Interpolation
(010)	Trigonometric Functions
(011)	Functions of (a ± B)
(012)	Sine and Cosine Functions
(013)	Trigonometry—Angle of Elevation, Depression
(014)	Trigonometry—Laws of Sines
(015)	Trigonometry—The Ambiguous Case
(016)	Trigonometry—Law of Cosines
(017)	Trigonometry—Inclined Plane
(018)	Composite Functions
(019)	Inverses of Trigonometric Functions
(020)	Inequalities—Polygonal Convex Set
(021)	Arithmetic and Geometric Sequences
(022)	Sequences and Series—Convergence and Divergence—Principle of Choice
(023)	Permutations, Combinations and Probability—Summary of Formulas
(024)	Permutations, Combinations and Probability
(025)	Binomial Theorem
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(027)	Statistics—Normal Probability Curve
(028)	Complex Numbers
(029)	Three Cube Roots of Unity
(030)	Special Theorems and Functions
(031)	Families of Lines
(032)	Angle of Intersection
(033)	Normal Equation of a Line
(034)	Polar Equation of a Line
(035)	Equation of a Circle
(036)	Length of A Tangent
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(005) Theorems on Inverses
(006) Theorems on Inverses
(007) Inverses of Equals
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(013) Absolute Value
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(019) Writing Equations—Examples
(020) Three-Dimensional Coordinate System
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(028) Determinant Properties 3 and 4
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(030) Determinant Property 7
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(032) Cramer's Rule
(033) Using Determinants

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(038) Rational Numbers
(039) Irrational Numbers
(040) Roots of Numbers
(041) Products of Roots
(042) Combining Radical Expressions
(043) Rational Exponents

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(048) Work Problems
(049) Solution Problems
(050) Base Ten Digit Problems
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(052) Mixture, Investment, and Ratio Problems
(053) Two Velocity Motion Problems
(054) Mensuration Problems

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(055) Relation, Domain, Range
(056) Function
(057) Inverse of a Relation
(058) Functional Notation
(059) Graphs of Functions
(060) Graph of $y = x^2$
(061) Graph of $y = x^2 + k$ and $y = ax^2$
(062) Graph of $y = ax^2 + k$
(063) Graph of $y = (x - h)^2$
(064) Graph of $y - a(x - h)^2 + k$
(065) Graph of $y = ax^2 + bx + c$
(066) Special Graphs
(067) Estimating Roots of Equations

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(068) Complex Numbers
(069) Addition of Complex Numbers
(070) Multiplication of Complex Numbers
(071) Conjugate Complex Numbers
(072) Quotients of Complex Numbers
(073) Using Complex Numbers
(074) Quadratic Formula
(075) Discriminant
(076) Sum and Product of Roots
(077) Radical Equations

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Unit XI—CONICS

(078) The Circle
(079) Parabola—Definition and Equation
(080) Parabola—Sketching
(081) Ellipse—Definition
(082) Equation and Graphing of Ellipse
(083) Hyperbola—Definition
(084) Hyperbola—Graphing and Equation
(085) Hyperbola of Form $xy = k$
(086) Graph of System with One Quadratic and One Linear Equation
(087) Algebraic Solution of System with One Quadratic and One Linear
(088) Graph of System with Two Quadratic
(089) Algebraic Solution of System with Two Quadratic Equations

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Unit XII—LOGARITHMS

(090) Graph of $y = b^x$
(091) Definition of Logarithm
(092) Logarithm of a Product
(093) Common Logarithm (Tables)
(094) Linear Interpolation
(095) Interpolation in Tables
(096) Antilogarithms
(097) Interpolating for Antilogarithms
(098) Logarithm of a Quotient and a Power
(099) Calculating with Logarithms
(100) Equations with Logarithms and Exponents
(101) Changing Bases in Logarithms

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(102) Synthetic Division
(103) Remainder and Factor Theorems
(104) Theorem Concerning Rational Roots
(105) Depressed Equations
(106) DesCartes's Rule
(107) Continuity and Graph of Polynomial Functions
(108) Location of Roots
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(002)	Infinite Sets—Definition
(003)	Points on a Line Segment
(004)	Examples of Denumerable Sets
(005)	Denumerability of Rational Numbers
(006)	Prime Number
(007)	Denumerability of Lattice Points in a Plane
(008)	Non-denumerability of Real Numbers
(009)	Equivalence—Points on Any Line Segment
(010)	Equivalence—Line—Ray
(011)	Equivalence—Line—Circle

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(003) Perpendicular to Line from Point
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(005) Construct Parallel at Given Distance
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(007) Construct Mean Proportional
(008) Divide Line-M Parts

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(010) Types of Angles
(011) Measurement of Angles
(012) Construct Triangle S.S.S.
(013) Construct Triangle S.A.S.
(014) Construct Triangle A.S.A.
(015) Construct Triangle A.A.S.
(016) Classification of Triangles
(017) Classification of Quadrilaterals

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(018) Locus—Given Two Parallel Lines
(019) Locus—Given Line
(020) Locus—Concentric Circles
(021) Types of Symmetry
(022) Geometric Design
(023) Optical Illusions

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Unit IV—CIRCLES

(024) Construct Through Three Points
(025) Circumscribe a Triangle
(026) Inscribe Circle in Triangle
(027) Construct Tangents to Circle from Point
(028) Centroid, Incenter, Orthocenter
(029) Inscribed, Circumscribed Polygons
(030) Common Tangents
(031) Arc, Sector, Segment of Circle

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(038) Area Circle
(039) Value of Pi
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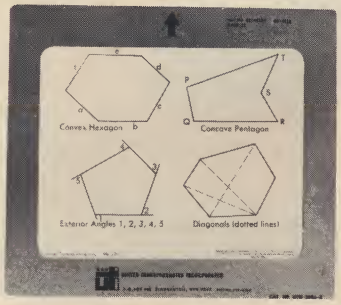

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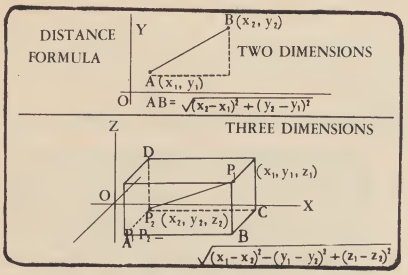

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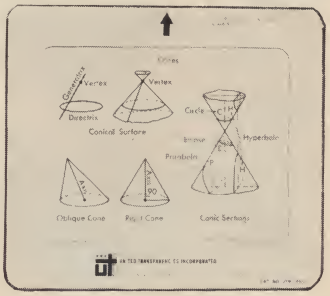

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(004)	Euler's circles
(005)	Hypothesis and conclusion
(006)	Converse, inverse, contrapostive
(007)	Transversal and related angles
(008)	Formal proof
(009)	Bisecting an angle
(010a)	Bisecting an angle
(110b)	Bisecting an angle
(210c)	Bisecting an angle
(011)	Terms associated with a polygon
(012)	Triangles classified by sides, angles
(013)	Special lines in triangles
(014)	Congruency
(015)	Congruency—A model proof
(016)	Triangles
(017)	Quadrilaterals—The parallelogram
(018)	Quadrilaterals—Symmetry
(019)	Inequalities in Triangles
(020)	Three Dimensional Concepts—Dihedral angles
(021)	Deductive proof
(022)	Three Dimensional Concepts—Polyhedral angles
(023)	Circles and Spheres—Diameter, radius
(024)	Spheres
(025)	Tangent circles
(026)	Concave and convex arcs
(027)	Polyhedrons
(028)	Prisms
(029)	Cylinders
(030)	Pyramids
(031)	Cones
(032(1)	Locus Relationships—problem 1
(033(1)	Locus Relationships—problem 1
(034(1)	Locus Relationships—Locus problem 1
(132(1)	Locus problem 2 (overlay)
(133(2)	Locus Relationships—Locus problem 2 (overlay)
(134(2)	Locus Relationships—Locus problem 2 (overlay)
(035)	Similar Polygons
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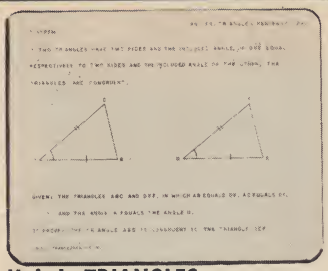

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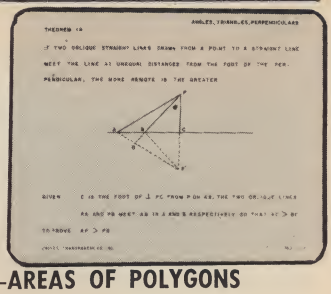

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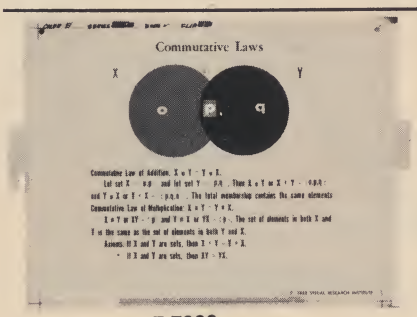

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(003) Logarithms of Trigonometric Functions 10" intervals (excerpt)
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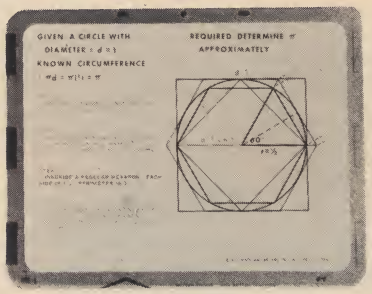

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(009)	Sets and Logic
(010)	Sets and Logic
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(012)	Sets and Probability
(013)	Conditional Probabilities
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(015)	Closure of Addition
(016)	Closure of Multiplication
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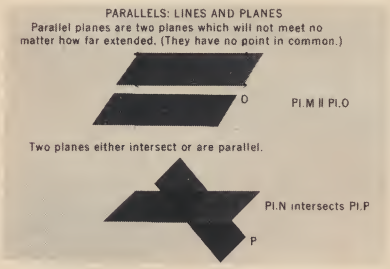

Unit I—ANGLE RELATIONSHIPS

(001) Bisectors (A)
(002) Bisectors (B)
(003) Angles—Plane and Dihedral
(004) Classifying Angles
(005) Adjacent Angles—Plane and Dihedral
(006) Complementary Angles—Plane and Dihedral
(007) Supplementary Angles—Plane and Dihedral (A)
(008) Complementary Angle Theorems—Plane and Dihedral
(009) Supplementary Angles—Plane and Dihedral (B)
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(011) Lines and Planes
(012) Determining a Plane (A)
(013) Determining a Plane (B)
(014) Altitudes, Medians, Angle Bisectors
(015) Congruence Postulates
(016) Congruent Right Triangles
(017) Isosceles Triangle Theorems
(018) Perpendicular Bisector Theorems
(019) Polyhedral Angles (Terminology)
(020) Polyhedral Angle Theorems
(021) Parallels—Lines and Planes
(022) Perpendiculars—Parallels
(023) Proving Angles Congruent—Supplementary
(024) Proving Lines Parallel
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(030) Parallelogram Theorems II
(031) Determining Parallelograms
(032) Rhombus Theorems
(033) Parallel Lines in Triangle
(034) Trapezoid Theorems

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(035) Prisms I
(036) Prisms II
(037) Prism Theorems
(038) Proportion Theorems
(039) Proportional Segments in Triangles
(040) Angle Bisector of a Triangle
(041) Parallel Planes
(042) Pyramids
(043) Pyramid Theorems
(044) Proportional Segments in Pyramids

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(045) Similar Polygons
(046) Similar Triangles
(047) Projection
(048) Projection in a Right Triangle
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(050) The 30°-60°, 45° Right Triangle
(051) Similar Polygons in Pyramids

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Unit VI—CIRCLES, SPHERES, CYLINDERS AND CONES

(052) Arcs and Chords
(053) Diameter Perpendicular to a Chord
(054) Congruent Chords
(055) Secants and Tangents
(056) Tangents and Circles
(057) Tangents From External Point
(058) Parallel Secants and Tangents
(059) Cylinders
(060) Cones
(061) Cylinder Theorems
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(063) Spheres
(064) Sphere Theorems I
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(066) Central and Inscribed Angles
(067) Angles Formed by Chords
(068) Angles Formed by Tangents and Secants
(069) Product of Line Segments
(070) Spherical Angle
(071) Spherical Triangles
(072) Polar Triangles
(073) Zones, Lunes, Pyramids, and Cones

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(074) Regular Polygon
(075) Circumference, Arc Length, and Area
(076) Segments and Sectors
(077) Sphere (Surface)
(078) Zones and Lunes

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(079) Sphere (Volume)
(080) Frustum of Regular Pyramid
(081) Frustum of Cone of Revolution
(082) Spherical Sector

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(083) Loci
(084) Bisector of an Angle
(085) Perpendicular Bisector
(086) Intersection of Loci (in a Plane)
(087) Circumcenter, Incenter, Centroid, Orthocenter
(088) Loci in Space
(089) Intersection of Loci in Space

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Unit XI—INEQUALITIES

(090) Inequalities in a Triangle
(091) Inequalities in Circles
(092) Inequalities in Spheres
(093) Unequal Line Segments (Plane)
(094) Unequal Line Segments (Space)

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(095) Tangents to a Circle
(096) Constructing Proportionals (A)
(097) Constructing Proportionals (B)
(098) Constructing Proportionals (C)

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(099) Parallel and Perpendicular Lines
(100) Equation of a Circle
(101) Area of a Triangle

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Unit XIV—PROVING THEOREMS ANALYTICALLY

(102) Parallelogram Theorems
(103) Rhombus Theorems
(104) Trapezoid Theorems
(105) Determining Parallelograms
(106) Parallels in Triangles

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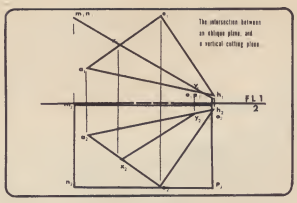

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(007) The True Slope of an Oblique Line
(008) True Slope, Bearing and True Length of an Oblique Line
(009) Three Oblique Intersecting Lines. True Slope, Bearing and True Length of Each
(010) Three Intersecting Lines, Having Different Slopes and Directions
(011) True Slope, True Length and Bearing of Two Intersecting Lines
(012) Two Intersecting Lines Having the Same Slope
(013) Point View of Two Parallel Lines
(014) An Oblique Line, and a Profile Line Appearing Parallel in an Elevation View
(015) The True Angle Between Two Intersecting Lines when the Top and Front Views are given
(016) True Angle Between Two Intersecting Lines. The Top View Given
(017) Shortest Distance from a Point to a Line. Solved by Showing the Point View of the Given Line
(018) True Size of an Oblique Plane, with Foldline Notations Emphasized
(019) True Size of an Oblique Plane
(020) Line of Maximum Slope of an Oblique Plane
(021) True Slope of an Oblique Plane when one Border Line of the plane is Profile
(022) Angle of an Oblique Plane makes with the Frontal Image Plane
(023) Passing Parallel Planes Through Two Nonintersecting, Nonparallel Lines, and both Planes as Edges in an Inclined View
(024) To Determine the Shortest Distance Between any Two Nonintersecting, Nonparallel Lines, Solved by the Line Method
(025) To find the Shortest Distance between Two Nonintersecting, Nonparallel Lines
(026) The Shortest, and Shortest Level Distance between Two Nonintersecting, Nonparallel Lines, Solved by the Plane Method
(027) The Shortest Distance between Two Nonparallel, Nonintersecting Lines of Given Grade
(028) Intersection Between an Oblique Plane, and a Vertical Cutting Plane
(029) A Pictorial Representation of Three Horizontal Projecting Planes Determining the Line of Intersection Between Two Planes
(030) To Find the Line of Intersection of any Two Oblique Planes, Using Two Views and Auxiliary Cutting Planes
(031) The Line of Intersection Between Two Planes, By Showing One of the Planes as an Edge
(032) To Find the Line of Intersection of any Two Oblique Planes. A view is Drawn Showing One of the Planes as an Edge, and including the Other Plane
(033) True Size of the Dihedral Angle by Projection
(034) To Find Where a Line Pierces an Oblique Plane Using Only the Two Given Views, and a Vertical Projecting Plane
(035) To Find Where a Line Pierces an Oblique Plane, Showing the Plane as an Edge
(036) To Draw a Line Perpendicular to a Plane from a Point not on the Plane, Edge View Method
(037) Passing a Plane Through a Point, and Perpendicular to a Given Line
(038) To Find the True Size of the Angle a Line Makes with a Plane
(039) A Point Revolving About a Frontal Line
(040) Revolving a Point About an Oblique Line
(041) A. The True Length of an Oblique Line, Using Revolution and a Vertical Axis
B. True Length of an Oblique Line, Using Revolution and a Level Axis
(042) True Size of an Oblique Plane by Revolution
(043) Angle Between a Line and Plane Solved by Revolution
(044) True Size of the Dihedral Angle by Revolution
(045) Projecting a Circle Upon an Oblique Plane
(046) An Oblique Cylinder in True Length, and Point View of the Elements
(047) A Line Piercing a Cylinder
(048) A Line Piercing an Oblique Cone
(049) A Cylinder of Revolution
(050) Development of Cone of Revolution
(051) Development of an Oblique Cone by Triangulation
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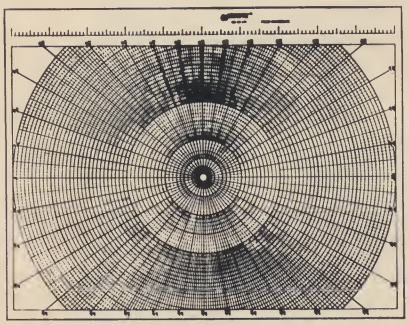

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(005) $f(x) = x^3$
(006) Broken Line Function
(007) $f(x) = x$
(008) $f(x) = [x]$
(009) $f(x) = \sin x$
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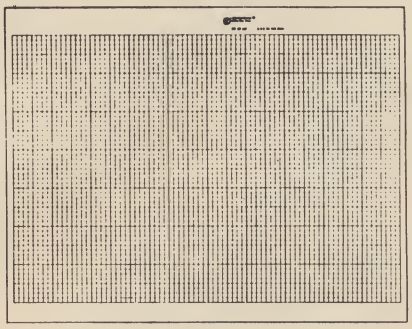

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(002) Similar Triangles
(003) Basic Definitions of Trigonometric Functions
(004) Rationalizing the Denominator
(005) Special Triangle (45%/90°)
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(007) Functions of 45°
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(010) Range of the Functions (0-90°)

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(011) Complementary Angle Theorem
(012) Trigonometric Definitions
(013) Algebraic Signs of Trig Functions
(014) Algebraic Signs of Trig Functions*
(015) Basic Reduction Theorem
(016) Reduction Formulas (Even Multiple of 90°)
(017) Reduction Formulas (Odd Multiple of 90°)
(018) Functions of Negative Angles
(019) Functions of Quadrantal Angles
(020) Functions in Terms of Other Functions

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UNIT III (Cont.)

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(027) Line Interpretation of Sine Function
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(029) Line Interpretation of Tangent Function
(030) Summary of Line Representation
(031) Sine Curve Generated from Line Functions
(032) Cosine Curve Generated from Line Functions
(033) Period and Amplitude
(034) Analysis of Sine and Cosine Curves
(035) Graph of $y = \sin \theta$ *
(036) Graphs of the Six Functions on one Axis
(037) Amplitude Variations in Sine Curves
(038) Period Variations of Sine Curves
(039) Rapid Sketching of $y = \sin x$
(040) Rapid Sketching of $y = \cos x$
(041) Sketching $y = \sin (kx = b)$
(042) Sketching $y = \cos (kx = b)$
(043) Sketching by Addition of Ordinates
(044) Sketching by Addition of Ordinates
(045) $y = \sin x$ and $y = \arcsin x$
(046) $y = \cos x$ and $y = \arccos x$

UNIT V (Cont.)

(047) $y = \tan x$ and $y = \arctan x$ *

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Unit VI—DOUBLE ANGLE FORMULAS

(048) Cosine of the Difference of Two Angles
(049) Sum and Difference of Two Angles
(050) Derivation of tan (A + B)
(051) Derivation of Sin 2a and Cos 2a
(052) Derivation of Sin a/2, cos a/2, tan a/2

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Unit VII—SINE LAW, COSINE LAW, AREA

(053) Law of Sines
(054) Law of Cosines
(055) The Ambiguous Case (Acute Angle)
(056) The Ambiguous Case (Obtuse Angle)
(057) Area of Triangles (SAS)
(058) Area of Triangles (ASA)
(059) Functions of Half Angles in a Triangle
(060) Area of Triangles (SSS) *

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(062) Complex Numbers as Vectors
(063) Coordinates and Vectors
(064) Vector Addition
(065) Application of Vectors
(066) Polar Form of Complex Numbers
(067) Multiplication of Complex Numbers
(068) DeMoiure's Theorem
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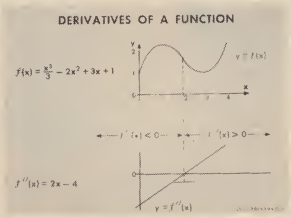

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Volume of a Solid
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